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International Conference on Innovative Research in Engineering, Management and Sciences (ICIREMS-2019)

Organised by
New Horizon College of Engineering, Ring Road, Bellandur Post, Bengaluru, Karnataka, India

International Conference on Innovative Research in Engineering, Management and Sciences

Organised by:

New Horizon College of Engineering, Ring Road, Bellandur Post, Near Marathalli, Bengaluru, Karnataka, India

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About Conference

1. To focus upon advances/innovations and emerging trends in the above said fields.

2. To present an experience the upcoming and exotic trends in the field of Science, Engineering, Management and Sciences

3. To disseminate expert knowledge to research scholars and student community.

CONTENTS

Mechanical Property Evaluation of Banana Fibre Reinforced Composite

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ABSTRACT

Polymeric materials reinforced with synthetic fibres such as glass, carbon and aramid exhibit high stiffness and strength to weight ratio as compared to conventional materials like metals. The potential of using natural fibres as reinforcements in Polymer Matrix Composites (PMC) to replace conventional synthetic fibres in structural applications has been in focus in the recent times. Synthetic fibres are not biodegradable and the manufacturing of synthetic fibres releases harmful emissions to the atmosphere. In the present work PMC with banana fibres as reinforcement in epoxy resin as the matrix and mango fibres as additives has been studied. The specimens are fabricated using the hand lay- up process with different orientation to test the mechanical properties.

Keywords : Fibre reinforced composite, mechanical properties, banana fibre, biodegradable, hand layup

I. INTRODUCTION

Natural Fibre Composites:

Fibre Reinforced Composites (FRC) has an immense scope in various industries. Automobile industry is also dependent on FRC for many parts and body panel. The synthetic fibres like glass, aramid etc., are not biodegradable and also the production process is not environmental friendly process. Therefore many researchers have studied the possibility of using natural fibres like jute, kenaf, hemp etc. to replace the synthetic fibers. The natural fibres are easily available and cost effective. Also they have low density and satisfactory mechanical properties which make them an attractive ecological alternative to man-made fibers used for the manufacturing of composites.

- Natural fibers can be categorized as:
- Animal Fibre
- Mineral Fibre
- Plant Fibre

Plant fibers generally include examples like cotton, jute, flax, ramie, sisal and hemp etc, which are made up of cellulose and are mainly used in the manufacture of paper and cloth. This can be further categorizes as,

- Seed fiber: The fibers that are collected from the seed and seed case, e.g. cotton and kapok.
- Leaf fiber: The fibers that are collected from the leaves e.g. sisal and agave.
- Skin fiber: The fibers that are collected from the skin or the stem of their respective plant.

Plant fibers exhibit high tensile strength as compared to other fibers due to which these fibers are used for

applications such as durable yarn, fabric, packaging etc. Example: flax, jute, banana, hemp, and soybean. Fruit fiber: The fibres that are collected from the fruit of the plant, e.g. coconut (coir) fiber.

Stalk fiber: The fibres that are actually collected from the stalks. Example: Straws of wheat, rice, barley, bamboo and grass. The natural fibers can be with thermosetting as well as thermoplastic matrices. Thermosetting resins such as epoxy, polyester, polyurethane, phenolic, etc. are commonly used as a matrix material in natural fiber composites in which composites are required for higher performance applications.

They provide good stiffness and strength properties. New materials based on renewable resources are gaining importance because of the wide spread awareness about the emission of greenhouse effect caused by the gases such as CO2 into the atmosphere and global ill-effects of fossil energy resources.

Banana fibre:

Banana is available in most parts of India, and banana fibre availability is more. The banana fibre is obtained from the stem of a banana tree. After banana is taken from the tree the whole tree is of waste especially the stem. The chemical composition of banana fibre is cellulose, hemicellulose, and lignin. It is a highly strong fibre. It is a very light weight fibre. The hydrogen bonds and other chemical linkages provide necessary strength and stiffness to the fibres. The density of banana fibre is 1300 kg/m3, tensile strength is around 355 MPa, young's modulus is 33.8 GPa and elongation at break is 5.3%. It has a strong moisture absorption quality; it absorbs as well as release moisture very fast.

The stem of the banana tree is in the form of layers. The strength of the fibre varies according to the layer position, as the layers goes towards the centre the strength starts to decrease. Hence, the outer layer has more strength compared to the inner layer. The outer layers are dried for few weeks to take out the

moisture present in the stem layers. The dried fibres are twisted for removal of more moisture as well as to reduce the size of the fibre. The thickness of the twisted fibre obtained will be around 1.8mm to 2.1 mm, this fibre is made into a yarn. The fibre yarn is then woven to make sheets. The banana sheets are used in this work because of all the above mentioned properties.

Fig. 1 Raw banana fibers

Mango fibre:

Mango is an abundantly available fruit in several parts of world. Mango fibre is also another natural fibre which has a better strength, environmental friendly, and also is bio-degradable. Mango fibre is extracted out of mango endocarp (mango seeds) after drying the seeds in sunlight for 2-3 days to remove the water content and then they are powered for use as filler. Mango seeds plays a major role for the material strength. The properties that mango seed imparts to composites are high strength to weight ratio, less weight, low cost. The major advantage is that it is a waste product. Once the mango is consumed the seeds are thrown to waste. These waste seeds can be used for manufacturing of composite materials. It can be used as particles or can be powdered and mixed with the binders. It can be used as filler in manufacturing natural fibre composites.

Fig 2.Powdered mango endocarp

Fabrication:

In the present work resin Araldite LY-556 and hardener Aradur LY- 951 are used as matrix materials. The readymade banana fiber sheets are used as resin and mango seed particles are used as filler/ additive material. The fabrication of the laminate was done using hand lay-up process.

Following are the specifications of the fabricated laminate:

- Process selection- Hand Lay-up Process
- Number of layers -3.
- Size of Laminates-300*300*4
- Length of fibers used-15mm.
- Orientation- Bi-Directional (0° & 90°)
- Resin: Hardener- 10:1
- Volume fraction= 50:50
- Weight of Resin used is 400 grams
- Therefore, the amount of hardener used =(1/10)*400 = 40gm
- Then mango seed is used as filler = 3%

Mold preparation: The base plate was cleaned with an abrasive paper. The surface is allowed to dry after cleaning it with a thinner solution. After drying, the surface was coated with silicon gel. The surface is now set for the mold layup.

The fibre is placed inside the mould and a sealant is placed over the fibre to create vacuum. This is to keep the fibre dry and not to make any contact with moisture. Water content should be as less as possible for the fiber to absorb the resin to the maximum. Maximum absorption of resin increases the strength of the composite fabricant. If the moisture is present in the fiber it will have a huge effect on the properties of final product.

Fig 3. Vacuum bagging process

Based on the above calculations resin (araldite LY-556) and hardener (Aradur HY-951) is mixed in 10:1 proportion. And 3% of mango endocarp powder is mixed with resin and hardener. 400 grams of resin, 40 grams of hardener and 12 grams of mango endocarp is mixed together. The resin and hardener mixture should be carefully selected such that, the resin should not cure in the curing pot itself.

Once the fibre is wetted with resin mixture, the perforation sheet is placed on top of the banana fibre. After all these processes are done, vacuum bagging is done after 30 minutes by switching on the vacuum and made to run for 1 hour. The laminate is then heated in the oven for 1 hour at 100^0C for curing.

II. RESULTS AND DISCUSSION

Tensile test is carried out after cutting the specimens to the required dimension according to the ASTM standards. Tensile tests produce a stress-strain diagram, which is used to determine tensile modulus.

L = Length (250 mm); W = Width (25 mm) ; t = Thickness (3 mm) ; P = Load
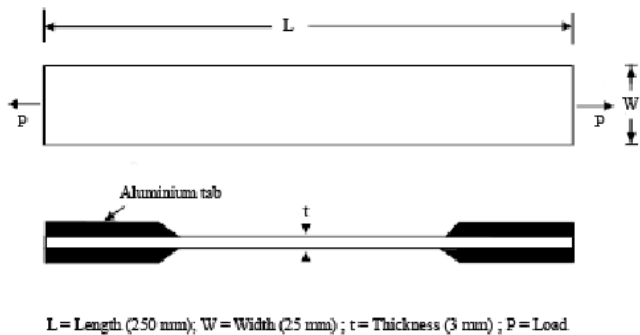
Fig 4. ASTM D3039 (Tensile test) specimen dimensions

Fig 5. Tensile testing of the specimen

Displacement
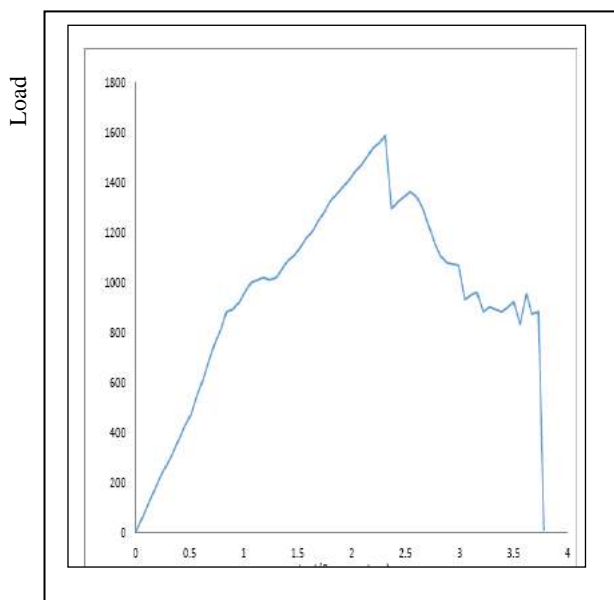
Fig 6. Tensile test graph for 0°/90°

Displacement
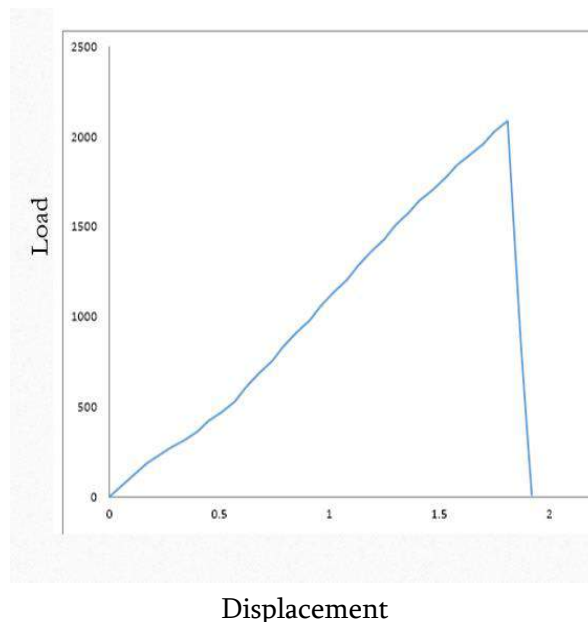
Fig 7. Tensile test graph for +45°/-45°

III. CONCLUSION

➤ The tensile test showed very good load bearing capacity for the 0/90 º direction with a peak load 1600N.

➤ The peak load for +45°/-45° was around 2000N.

➤ The laminates showed good results in both the cases. Also, the strength of the fiber is higher in longitudinal direction than that of transverse.

➤ The results give scope for the application of these natural fibers in interior of automobiles.

➤ The addition of mango particles have given improved results in tensile strength compared to the results with only banana fibres.

➤ The work can be extended by increasing the number of layers and varying the percentage of fibres.

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Fabrication of a Dry Cell Oxy Hydrogen Generator

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ABSTRACT

This paper discusses fabrication of oxy hydrogen generator using wet cell electrolysis method using SS304 stainless steel plates and neoprene gaskets. Using hydrogen as IC engine fuel is been an interested field of research for a long time, the interest in using hydrogen as IC engine fuel is increased recently due the shortage of fossil fuels and introduction of electric vehicles. The need for an alternative fuel to regular fossil fuels is increased as never before. In this paper a research is carried out on understanding the different methods of generation of oxy hydrogen, selection a best method based on various criteria, namely efficiency, availability of materials and cost. On the same basis mentioned, SS304 stainless was used to make the dry cell hydrogen generator. Amount of oxy hydrogen generated and method to add oxy hydrogen to engine intake and conducting engine performance and emission characteristics have to be done further.

Keywords : Oxy Hydrogen, Wet Cell, Stainless Steel

I. INTRODUCTION

Fossil fuels such as petroleum, coal and natural gas, which are used for power generation for decades are being depleted rapidly. Also, combustion byproducts are causing numerous problems, such as the ozone layer depletion, green house effect, acid rains, air pollution and environment pollution, which are dangerous for human health and our environment.

Though the research for mobility is shifted focus towards electric propulsion vehicles (electric vehicles) and majority of automotive industries have stopped funding for research on IC engines. Many engineers believe IC engines are here to stay for quite some time and are going to be a parallel technology to electric vehicles till the time electric vehicles become the prime mobility solution in the near future. One method by which the emission problems of fossil fuel IC engines can be overcome is by replacing fossil fuel by hydrogen fuel which is a clean and efficient fuel. Combustion of hydrogen does not emit ozone layer depleting chemicals and greenhouse gases.

In this paper a research on different oxy hydrogen generation methods is done to find out best method. A dry cell generator is fabricated.

II. METHODOLOGY

- Literature study of electrolysis methods for production of oxy hydrogen and using it as engine fuel
- Fabrication of oxy hydrogen generator
- Modify the engine inlet for oxy hydrogen induction

III. LITERATURE STUDY

Most early engine were designed for burning a variety of gases, including natural gas and propane.

When hydrogen was used in these engines it would backfire. Since hydrogen burns faster than other fuels, the fuel-air mixture would ignite in the intake manifold before the intake valve could close. Hydrogen gave less power than gasoline with or without the water. [1]

Hydrogen and pure oxygen were considered for submarine during world war use because the crew could get drinkable water from the exhaust. Hydrogen was also considered for powering airship engines.

Oxy-hydrogen Gas as a IC Engine Fuel

Oxy-hydrogen is a mixture of hydrogen and oxygen gases, typically in a 2:1 atomic ratio; the same proportion as water. At normal temperature and pressure, oxy-hydrogen can burn when it is between about 4% - 94% hydrogen by volume and with flame temperature around 2000 C. [5]

Automotive fuel enhancement systems inject either a hydrogen-petrol mixture, or pure hydrogen into the intake of the IC engine. A small amount of hydrogen is added to the intake air-fuel charge permits the engine to operate with leaner air-to-fuel mixture. As the air/fuel mix approaches leaner values the temperature of combustion decreases effectively reducing NOx production. A 50% reduction in gasoline consumption at idle was reported by numerically analyzing the effect of hydrogen enriched gasoline on the emission, performance and fuel consumption of a small spark-ignition engine. [5]

Under most loads near chemical correct air/fuel mixtures are still required for normal acceleration, although under idle conditions, reduced loads and moderate acceleration hydrogen addition in combination with lean burn engine conditions can result in a running of the engine with many advantages in terms of fuel consumptions and emissions levels. [4]

Comparing the properties of gasoline and hydrogen, it is possible for hydrogen engines to operate with very lean mixture, achieve good fuel economy and emissions reductions. The concept of oxy hydrogen as a combustion enhancer for internal combustion engines has a greater interest than pure hydrogen powered engines because it involves fewer modifications to the engines and their fuelling systems.

After the emission and performance analysis result are compared and considerable change were observed, Reduction in the fuel consumption of the vehicle up to 30%, increase in power and performance was observed. Once you switch to supplemental hydrogen, it will enhance power and performance in your car.

Use of oxy hydrogen in gasoline IC engines improved the combustion efficiencies reduced fuel consumption by 20%, reduction in emission of pollutants like carbon monoxide and unburnt hydrocarbons, power output increased by 5.7%. [4]

Introduction of HHO led to increased power and torque. The engine tended to run richer under higher loads. There was a significant reduction of unburned hydrocarbons as a result of the increase in HHO inclusion. Introduction of HHO led to improved combustion particularly at low loads. [5]

Hydrogen Production:

Hydrogen does not occur free in nature like conventional fossil fuel. Source of energy like nuclear, solar or hydro-electric is required to split it from original combined form. The following methods are used for production of hydrogen:

Electrolysis of H_2O

In this process, electrical power is utilized to split water into H_2 and O_2. An electrolysis cell contains two electrodes, commonly carbon plates or a flat metal, immersed in an aqueous electrolyte solution.

A source of DC source is connected to the electrodes, electric current conducts through the electrolyte from anode to cathode. As a result, water in the electrolyte solution is broken into H_2 which is obtained at the cathode and oxygen at the anode. Since water is a poor conductor of electricity, an electrolyte like KOH is used to improve its conductivity.

Thermo chemical method

This method is considered potentially most promising. It depends on complex series of interactions between the primary energy, water and some specific chemicals to produce hydrogen at temperatures substantially lower than thermal decomposition. The chemicals used are recyclable. A variety of compounds of iron, iodine, lithium and cadmium are used for the purpose.

Photobialysis

In this process, action of certain catalyst to produce H_2 from water by use of directs sunlight at ambient temperature. Though, it appears attractive, the present efficiency of production is only 1%.

IV. WORK DONE

Hydrogen Generator Selection:
Wet Cell:

Fig.1 Wet cell generator

A wet cell is an oxy hydrogen generation system in which the electrodes are immersed in the electrolyte aqueous liquid. And then the current is passed through. This creates an arc in the electrodes and the water is split into two gasses mainly oxygen and hydrogen.

It requires very less power and is efficient for small quantity of gas production.

Dry Cell:
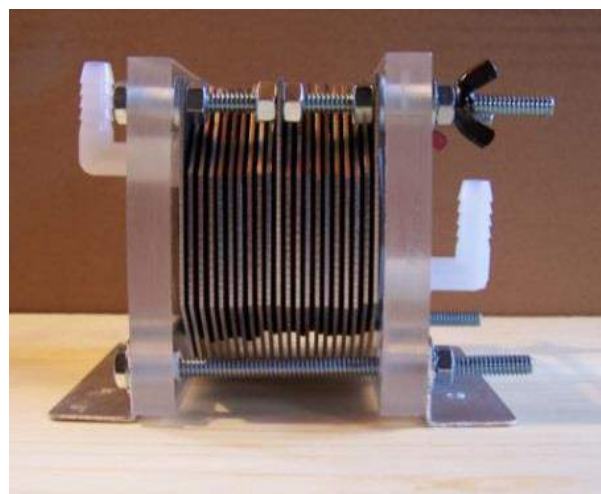
Fig. 2. Dry cell generator

A dry cell is an oxy hydrogen generation system in which the electrodes are fixed and the water is made to pass through the electrodes. It runs lesser amps and works cooler and has high gas production. Weight of dry cell is more compared to wet cell and cleaning of the electrodes should be done frequently. By taking into account all its advantages an disadvantages, and also its feasibility in the internal combustion engine, we have selected the dry cell.

V. FABRICATION

Selection of Electrolyte

KOH (Potassium Hydroxide):- Potassium hydroxide also known as 'caustic potash' is highly caustic. This needs to be handled carefully and kept away from any contact with skin, and even more importantly our eyes. 10% KOH concentration is so far reported

and understood to be the optimum. KOH weighs approximately 11 grams per heaping teaspoon.

Components Required For The Dry Cell System:-
Stainless Steel Plates:
SS304:
The SS304 plate contains 18% chromium and 8% nickel whereas the SS316 plate contains 10% nickel, 16% chromium and 2% molybdenum. The molybdenum is to help resist chlorides corrosion.

Neoprene Gasket:
Neoprene is a type of synthetic rubber that are created by polymerization of chloroprene. Neoprene exhibits good chemical stability and maintains flexibility over a wide temperature range. Neoprene is sold either as solid rubber or in latex form, and is used in a wide variety of applications. Like Electrical Insulation, Membranes and fan belts.

Cover Plate:
ABS Plastic is a common thermoplastic used in high temperatures. The most important property of ABS are toughness and impact resistance. ABS polymers are resistant to aqueous acids, concentrated phosphoric and hydrochloric acids and alkalis.

Construction of Oxy-hydrogen Dry Cell
To construct the oxy hydrogen dry cell core the selected SS304 steel plate should be cut to 7" by 7" and 6 holes should be drilled on the plate for the water to pass through, 4 holes in the bottom and 2 holes on the top

Fig. 3. Stainless steel plates in required shape

The neoprene gasket of thickness 2mm is cut to the plate dimensions, this gasket is then cut on the inside of the dimension 6 by 6 inch.

The gasket creates an airtight seal between the two plates and prevents the leakage of water.

Fig. 4. Neoprene Gasket cut in shape
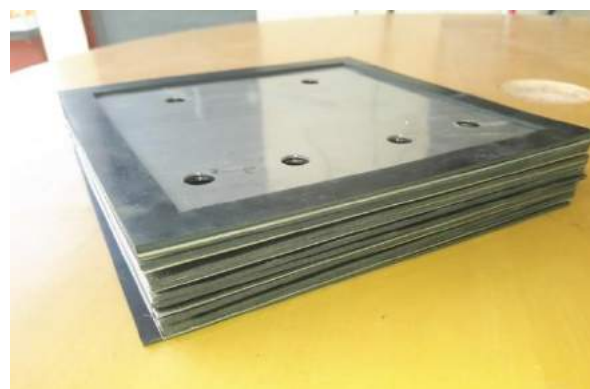
Fig. 5. Neoprene gasket and stainless steel put together

The cover plates are of 9 by 9 inch and 0.5 inch thick. With one brass fitting connected on top and two fittings on the bottom.
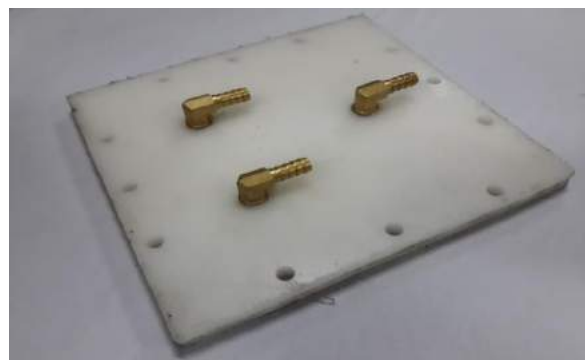
Fig. 6. Cover plate with brass fittings

All these components are connected together to form the core of the oxy-hydrogen generator. The

effective plate configurations are 11plate cell in which 3 plates are the electrodes and the other 8 are the neutral plates.

The plate configuration is given by:-

$+$ N N N N $-$ N N N N $+$ $=$11 plates in total with 3 electrodes and 8 neutral plates

Fig. 7. Oxy hydrogen generator core

The construction of the reservoir is simple as it requires a 5 liter jerry can. The reservoir is used to hold the water solution . The holes are drilled at the bottom and top of the can for the connection of inlet and outlet of the core there is another hole drilled on top of the can which connects to the bubbler. The jerry-can is plastic or metal. The reservoir contains 4 liters of water and KOH solution.

The construction of the bubbler is done with the help of an acrylic tube which is cut up to 5 inches in length and is 3 inches in diameter. The bubbler is then closed with 2 end caps which have brass fittings on both of them.

The final assembly of this system is done on a wooden board for easy transportation and a 12 volt battery is used for the working of the generator system.

Fig.8. Oxy-hydrogen generator system

The oxy-hydrogen gas generator shown above is a dry cell system with 11 plate configurations; it consists of 3 electrodes in which 2 are connected to the positive and the other one to the negative. These are connected to the 12 volt battery. The other 8 plates are neutral plates which are used to reduce the voltage by 1.2 volts, which is the optimum voltage for the plate to break down the water solution into hydrogen and oxygen.

VI. CONCLUSION

In this paper a dry cell oxy hydrogen generator was fabricated using SS304 stainless steel plates and neoprene gasket. SS304 was used because of its availability and cost. The constructed oxy hydrogen generator is generating oxy hydrogen at a steady rate, which is evident by seeing the bubbler. Quantity of oxy hydrogen generator should be measured accurately and provision to add oxy hydrogen to the engine intake has to be made in future to study the engine performance and emission characteristics.

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Mechanical Behaviour of Chicken Feather Reinforced Polymer Composites

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ABSTRACT

The goal of this proect is to use and assess the mechanical properties of the chicken quill strengthened polyester composites. Preceding creation of the composites, the chicken plume strands (CFF) were cleaned, tried and dissected as far as physical properties; straight thickness and elastic conduct. The unidirectional CFF fortified composites were created with polyester resins with various extents. Trials were led to decide physical properties of the control (0%) and CFF fortified composites; tensile,flexural and Charpy impact testing. It was discovered that the impact properties of the CFF strengthened composites are altogether superior to the control composites. Anyway both the malleable and the flexural properties of the CFF fortified composites have less fortunate qualities contrasted with the control composites. The CFF fortified composite have potential applications because of its improved impact conduct. Therefore the poultry waste can be used for any designing application and they will be favored because of minimal effort and prevalent attributes and the above all they won't cause biological and medical issues

Keywords : Chicken Feather, Composites, Mechanical Properties, Polyester

I. INTRODUCTION

1.1.COMPOSITE MATERIALS

Since the beginning, mechanical advancements have helped mankind improve their ways of life, with the rate of advancement and research is so amazing. In any case, certain innovation likewise makes a negative natural effect. In this manner endeavors are put resources into utilizing characteristic based biodegradable and manageable material that exist in nature as opposed to make another material. Material structures fortified composites, explicitly with filaments, have picked up significance in designing and specialized applications because of their light weight, higher constancy, predominant flexibility and quality, great warm opposition, low thickness, and better unbending nature [1-3]. The CFF are normally depicted as a loss result and they are adding to ecological contamination because of the transfer issues. There are two fundamental chicken plume transfer strategies that exist, a consuming and covering. Them two have negative effect on nature. Ongoing investigations on the chicken feathers showed that the waste can be a potential composite support. The composite fortification use of the CFF offers considerably more compelling approach to comprehend ecological concerns contrasted with the conventional transfer techniques. A portion of the upsides of the CFF are economical, inexhaustible, and plentifully accessible. The CFF as a composite support having certain attractive properties including lightweight, high warm protection, superb acoustic properties, non-rough conduct and incredible hydrophobic properties. The CFF has the least thickness esteem contrasted with the all normal and

engineered strands [4-7]. Castano et al found that the CFF keratin biofibres permits an even appropriation inside and adherence to polymers because of their hydrophobic nature and they revealed that CFF strengthened composites have great warm solidness and low vitality dispersal [8]. The primary motivation behind this examination is to produce and decide the mechanical properties of the CFF strengthened vinylester and polyester thermoset composites. The chicken plume strands were tried and dissected to recognize the accompanying properties; direct thickness, breaking lengthening and determination. The CFF strengthened composites were created by hand layup system in the research facility. Vinylester and polyester gum were utilized as lattices and the composites were fabricated by utilizing three distinctive fiber stacking extents. The mechanical properties of these composites were resolved and looked at including tractable, flexural and Charpy impact properties.

II. MATERIALS AND METHODS

2.1. MATERIALS

The raw materials used in this work are
1. chicken Feather
2. Polyester resin
3. Methyl Ethyl Ketone Peroxide
4. Cobalt

2.1.1. Chicken Feather

Chicken feather is collected from the poultry farms. It is the waste of chicken which are cleaned well. After the washing process the chicken features were rinsed and leftto dry for 24 hours under normal room temperatures. and dried in sun light. The dry feathers are cut into short fibers.

2.1.2. Polyester resin

Softener (Araldite LY 556) made by CIBA GEIGY limited having the following outstanding properties has been used as the matrix material.
a. Excellent adhesion to different materials.
b. High resistance to chemical and atmospheric attack.
c. High dimensional stability.
d. Free from internal stresses.
e. Excellent mechanical and electrical properties.
f. Odourless, tasteless and completely nontoxic.
g. Negligible shrinkage.

2.1.3. Hardener

In the present work hardener (HY951) is used. This has a viscosity of 10-20 MPa at 25°c.

2.2. SPECIMEN PREPARATION
Preceding the composite assembling, the CFF tests were adapted for 48 hours at 65% RH and 20°C [9]. The fiber straight thickness esteems were resolved as per ASTM D1577 [10] and the elastic properties of the filaments were resolved as per ASTM D3822 [11]. The composites were created with various fiber loadings (0%, 2.5%, 6% and 10%). At first, polyester resin was blended in Gobalt utilizing a blender in a bowl after the polyester, resin was additionally arranged independently. The grid materials were set up in a segment of 73% of resin framework and 23% of hardener by volume. At that point, the strands were spread into shape and secured with the grid. The composites were made by utilizing a hand lay up method with size form of 300 mm length x 300 mm width x 20 mm thickness. The composites were kept for 24 hours at room temperature and along these lines put in a broiler for 8 hours at 80°C for restoring. The control and the CFF strengthened composites were assessed as per ASTM D3039/D3039M (Tensile Properties of Polymer Matrix Composite Materials), EN ISO 14125 (Fibrereinforced plastic composites-Determination of flexural properties), and EN ISO 179-1 (Determination of Charpy impact properties).
2.3. HAND LAY –UP METHOD

Hand expose up is a open molding method appropriate for making a wide assortment of composites items including: pontoons, tanks bathware, lodgings, truck/auto parts, engineering items and numerous different items extending from extremely little to exceptionally enormous. Generation volume per form is low; be that as it may, it is possible to deliver generous creation amounts utilizing various molds. Straightforward, single-pit molds of fiberglass composites development are commonly utilized. Molds can run from exceptionally little to huge and are ease in the range of delicate composites molds. Gel coat is first applied to the shape utilizing a splash weapon for a great surface. At the point when the gel coat has restored adequately, move stock fiberglass fortification is physically put on the form. The cover tar is applied by pouring, brushing, showering, or utilizing a paint roller. FRP rollers, paint rollers, or squeegees are utilized to merge the cover, completely wetting the support, and expelling ensnared air. Ensuing layers of fiberglass support are added to manufacture cover thickness (Fig 2.1). Easiest strategy offering minimal effort tooling, straightforward preparing and wide scope of part estimates are the significant focal points of this procedure. Configuration changes are promptly made. There is a base interest in gear. With gifted administrators, great generation rates predictable quality is realistic.

III. RESULTS & DISCUSSIONS

This paper presents the mechanical properties of the chicken reinforced polyester composites prepared for this present investigation. Details of processing of these composites and the tests conducted on them have been described in the previous chapter. The results of various characterization tests are reported here. This includes evaluation of tensile strength, flexural strength, impact strength and micro-hardness has been studied and discussed.

3.1. Mechanical Characteristics of Composites

The portrayal of the composites uncovers that the fiber content is having critical impact on the mechanical properties of composites. The properties of the composites with various fiber substance under this examination are introduced in Table 3.1.

Table 3.1 Mechanical properties of the composites

Specimen	Hardness (HB)	Tensile strength,(N)	Flexural strength (N)	Impact energy (KJ/m²)
A	17	989	48	3.25
B	14.6	1115	67	4.26
C	18.9	1305	117	8.96
D	21	2589	148	12.5

3.2. DISCUSSIONS

3.2.1. Effect of Fiber content on Micro-hardness

The deliberate hardness estimations of all the four composites are introduced in Figure. It tends to be seen that the hardness is diminishing with the expansion in fiber content upto 60%. Anyway further increment in fiber content builds the smaller scale hardness esteem.

3.2.2. Effect of Fiber content on Tensile Properties

The test results for rigidities and moduli are appeared in Figures 4.2 and 4.3 individually. It is seen that the rigidity of the composite increments with increment in fiber substance. There can be two purposes behind this expansion in the quality properties of these composites thought about. One plausibility is that the concoction response at the interface between the filler particles and the network might be too solid to even think about transferring the elastic. From

Figure 4.3 plainly with the expansion in fiber content the malleable moduli of the chicken strengthened polyester composites increments bit by bit.

3.2.3. Effect of Fiber contents on Flexural Strength

Figure 4.4 shows the correlation of flexural qualities of the composites acquired tentatively from the curve tests. It is intriguing to take note of that flexural quality increments with increment in fiber content.

3.2.4. Effect of Fiber contents on Impact Strength

The effect vitality estimations of various composites recorded during the effect tests are given in Table. It demonstrates that the protection from sway stacking of coconut chicken fortified polyester composites improves with increment in fiber substance as appeared in Figure4.5. High strain rates or effect burdens might be normal in many building utilizations of composite materials. The reasonableness of a composite for such applications ought to in this manner be resolved by regular plan parameters, however by its effect or vitality retaining properties.

X-Axis-Fibercontent   90%,80%,70%,60% respectively

Y-Axis   -Micro Hardness
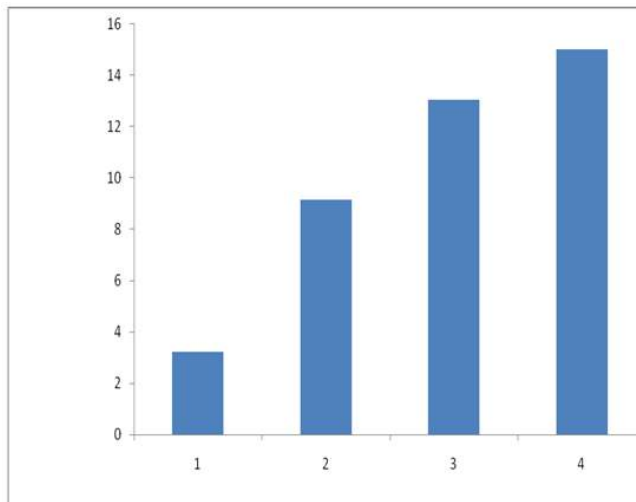
Figure 4.2 Effect of fiber content on tensile strength of composites

X Axis - specimens

Y Axis - Tensile strength in MPa.
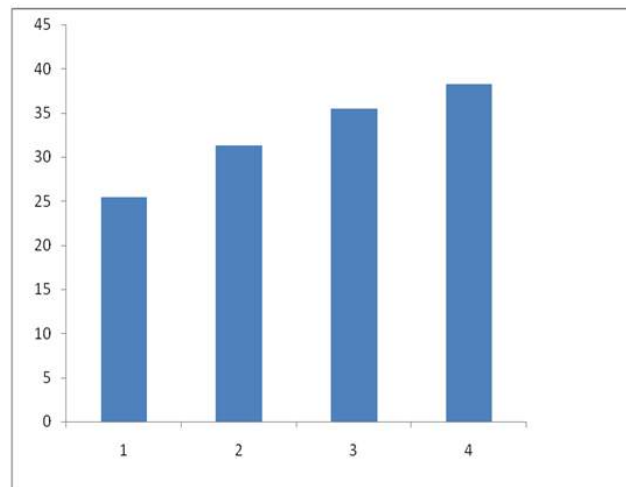
Figure 4.4 Effect of fiber content on flexural strength of composites

X Axis- Specimens

Y Axis- Flexural strength in Mpa

Figure 4.1 Effect of fiber content on micro-hardness of the composites
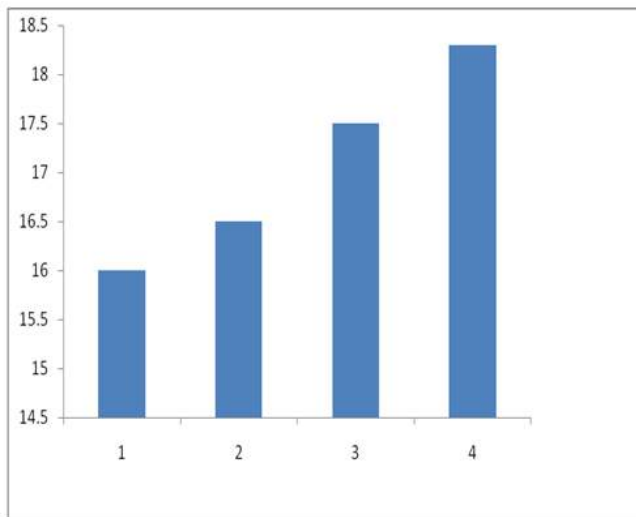
Figure 4.5 Effect of fiber content on impact strength of composites

X Axis- Specimens
Y Axis – Impact strength in KJ/m²

IV. CONCLUSION

This trial examination of mechanical conduct of coconut chicken fortified polyester composites prompts the accompanying ends:

This work shows that fruitful manufacture of a chicken fortified polyester composites with various fiber substance is conceivable by straightforward hand lay-up strategy. It has been seen that the mechanical properties of the composites, for example, smaller scale hardness, elasticity, flexural quality, impact quality and so on of the composites are additionally enormously affected by the fibre substance.

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In vitro Antioxidant and Antihemolytic Activity of Triticum aestivum Linn.

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ABSTRACT

Plant based medicines are understood and widely accepted as alternative therapies for many diseases. The present work investigated the antioxidant and antihemolytic properties of extracts of Triticum aestivum (wheatgrass) have been analyzed and quantified for the phytochemical constituent's such as total phenolics, tannins, and flavonoid contents. High–performance liquid chromatography revealed the presence of many phytoconstituents with medicinal value. Antioxidant and RSA was determined by in vitro assays such as hydrogen peroxide, nitric oxide, 1,1-diphenyl-2-picryl-hydrazyl (DPPH) radical scavenging and total reductive ability. These results proved to be promising and were confirmed by its ability to mitigate free radical induced erythrocyte damage.

Keywords : Green grass, antioxidant, antihemolytic, Triticum aestivum, phytochemical, free radical damage, erythrocytes.

I. INTRODUCTION

Noxious dietary patterns and sedentary lifestyle practices (smoking, consumption of alcohol, prolonged exposures to harmful UV rays, ionizing radiations, etc.) have shown to cause pathological damage in the body's cells and tissues resulting in deleterious impacts[1]. This causes a morbid stress in the body, leading to the generation of unstable free radicals [2,3,4]. These free radicals, by the virtue of their chemical properties, tend to be highly reactive so as to pair up with other molecules, atoms or even a single electron in order to achieve the state of stability. They get involved in a variety of chemical reactions in the body such as hydrogen abstraction, termination, addition, disproportionation, etc., to reach a more "bound" state, leading to the utilization of more free molecular oxygen, causing to what is known as "oxidative" stress in the body[3].

Free radicals induced damage in the biological systems is most clearly comprehended using blood as

a promising model[5]. Blood being the fluid connective tissue of the body becomes easily susceptible to this damage due to free radical induced physico chemical damage of RBC membranes leading to hemolysis[6], which subsequently creates an "oxygen" deficit condition in the body leading to hypoxia and related chronic ailments like cancer, diabetes, neurological damages and cardiovascular diseases[4].

Traditional herbal medicines, today have been shown to act as what is called "alternate medicines", due to their less toxic and multi-targeted potential in the body[6]. They are a repository of a widespread amount of antioxidants, which can be used to the development of what is known as "novel" drugs[7]. The present work is one such attempt to look at the protective effect of wheat grass against free radical induced erythrocytic. Wheatgrass being an herbal medicine, is known to have attracted the attention of the society for the prevention of many diseases[8].

Triticum aestivum (**wheat grass**) (commonly known as bread wheat) is one of the most abundantly grown wheat specie in the world. *Triticum ae* sp. belongs to the family Poaceae[9]. The plants of this family are all monocots, primarily grasses. Some commonly found plant species belonging to this family include *Cynodon dactylon, Poa annua, Zea mays*, etc. (North American Range Plants*, James L. Stubbendieck, Stephan L. Hatch, Charles H. Butterfield*)[10]. Wheatgrass is generally grown throughout the year and is most commonly seen to propagate in almost all regions of the world. Fifteen to twenty species of wheatgrass have been documented, of which have been reported to occur in India[11].

Wheatgrass is a good pool of mineral nutrients. It is a rich repository of iron, phosphorus, magnesium, manganese, copper & zinc[13]. Wheatgrass is an excellent headspring of tocopherols with other phytochemical compounds[11]. It helps to trigger metabolic activities, maintains the alkalinity, and hence reducing the over-acidity in the blood. It also aids in reinstating the healthy cells by acting as a detoxifier[12]. They tend to possess various antioxidant potentials and thus is seen to inactivate many free radical induced damages in the human body[14]. Typically, wheatgrass is shown to be a house of - reducing sugars, anthraquinones, saponins, flavonoids, tannins, alkaloids, terpenoids, and phenolics, which help majorly in antioxidant activities[15]. It's said to have anticancer activities according to the Traditional system of medicines[9].

Wheat grass has shown to be a promising modal for curing a variety of diseases[16]. Its juice is being proved to be hypolipidemic[17] hypoglycemic [18] hepatoprotective [19] in rat models and the chemopreventive action of wheat grass [20]. Pilot studies to a considerable extent were performed on human models wherein wheat grass juice was found to reduce transfusion requirements in patients with thalassemia major [21].Also, the plant has been shown to be [22] (through a randomized,double bind,placebo-controlled study of the plant against spirulina) an effective protectant against lipid peroxidation. It also has a major role in curing active distal ulverative colitis by tests performed on controlled trials [23]. Works on human chronic myeloid leukemia cells lines revealed the antiproliferative and apoptotic activities of the plant [24].The plant juice has to a certain extent been proven to improve the hematological conditions in patients with breast cancer [25]. It has shown to have the property of optimizing blood sugar levels and so has been examined to prove its effectiveness in curing diabetes mellitus[26]. Quantitative assays performed on the plant revealed that a particular chemical called MPa (**methylpheophorbide a**), has potent abilities in curing cancer [27]. Acute oral toxicity levels for the plant was being demonstrated, revealed a significant no mortality results in Swiss Albino mice trials with a dosage of 2000 mg/kg seen for 14 days [28]. All these results have shown that the plant has a significant pharmacological benefit and thus can be used in the long run to cure a variety of diseases.

Design of Experiments

Plant Material and extraction

The grass of *Triticum aestivum* used in the study was grown indoors in earthen pots filled with 2.5 inches of soil (3 parts) mixed with compost (1 part). Harvesting was done on the tenth day when the grass grows approximately 5-6 inches tall for further experimentation [29]. Ethanolic extract (10% w/v) of wheat grass powder was prepared using the method of Arpita *et al.*, 2012. wherein the freshly harvested grass was freeze dried in vacuum (2.4×10^{-2} mB) with a condenser temperature set at -49^0C for 6 h. Aqueous extracts of *Triticum aestivum* (AET) was prepared by using sequential extraction method [30]

Estimation of total Phenolic, Flavonoid and Tannins content

Total phenolic content [TPC] expressed as milligrams of gallic acid equivalents [GAE] per gram of dry extract [mg GAE/g of dry extract], total flavonoid content [TFC] expressed as milligrams of rutin equivalents [RE] per gram of dry extract [mg RE/g of dry extract] and the total tannin content [TC] of both the individual phytoextracts were determined using the standard methods [30]

Identification and Quantification of the Polyphenols using HPLC

Polyphenolic contents of the extract were obtained chromatographically by separating them on a reverse phase Luna 5 μm C18 (2) (100 Å, LC Column 250 x 4.6 mm). Gallic acid, tannic acid, catechin, β sitosterol, rutin, quercetin, and betain (100μg/ml of each) were used as standard polyphenols.

In vitro Antioxidant Assays:
Hydrogen peroxide (H₂O₂) scavenging ability:

H₂O₂ radical scavenging ability of the extracts was examined according to the method employed by Tuba and Gulcin [31], with few modifications. To 3.4

ml of a plant extract and the standard antioxidant - ascorbic acid (dissolved at different concentrations of 5-100 μg/ml in phosphate buffer - 50 mM, pH 7.4), 0.6 ml of H_2O_2 was added and incubated at room temperature for 10 min. The decrease in the absorbance of H_2O_2 upon oxidation was monitored at 230 nm spectrophotometrically against a suitable blank (phosphate buffer alone). BHA was used as a standard antioxidant, control (phosphate buffer and H_2O_2) was prepared and the percentage inhibition was calculated using the expression:

Percentage inhibition (%) = (OD of control – OD of extract/OD of control) $\times$ 100   (1)

The extracts concentration providing 50% of inhibition (EC₅₀) was calculated from the graph of percentage inhibition plotted against extract concentration.

Nitric oxide (NO) scavenging activity:

NO radical scavenging abilities of plant extracts were assessed by using the method employed by Royer *et al.* [32]. The color intensity of the chromophore formed as a result of diazotization of nitrite with sulfanilamide and subsequent coupling with naphthyl ethylenediamine hydrochloride was measured colorimetrically at 546 nm against a suitable blank (2 ml of H₂O and 0.6 ml Griess reagent). Control (200 μL SNP, 800 μL H₂O and 300 μL Griess reagent) was run and the percentage inhibition was calculated using equation 1 mentioned above and compared with ascorbic acid which is used as a standard antioxidant. EC₅₀ values for the plant extracts were estimated.

DPPH free radical scavenging activity

Antioxidant activities of the plant extracts were assessed based on DPPH free radical scavenging activity using Blois method [33] with a few changes. Ascorbic acid prepared at similar concentration ranges like the aqueous plant extracts was used as a standard positive control. Percentage inhibition was

calculated by comparing tests with control (3 ml of DPPH) using equation 1.

Preparation of erythrocyte suspension

Blood samples from healthy male/female (non-smoker and non-alcoholic) volunteers were collected into heparinized vaccuettes through venipuncture after taking informed consent. After a gentle swirling, the tubes were centrifuged at 1500 g for 10 min at 4°C and the plasma and buffy coat were removed. The resulting erythrocytes were washed thrice with 10 volumes of PBS (PBS - 10 mM having NaCl - 150 mM, NaH_2PO_4 - 1.9 mM and NaH_2PO_4 - 8.1 mM, pH 7.4) and centrifuged again at 1500 g for 5 min. The thick fluffy coat was removed with care after each centrifugation. Erythrocyte suspension stock of 10% v/v was prepared in PBS and kept at 4°C and used within 6 h.

In vitro hemolysis assay

To look at the protective antioxidant effect of the aqueous plant extract on the free radical induced oxidative damage on human erythrocytes, *in vitro* hemolysis assay was performed as adapted by Girish *et al*. [34].

II. RESULTS

Phytochemical Evaluation of the Aqueous Extract of *Triticum aestivum*

The concentrations of the polyphenols vary depending on many environmental factors and the extraction techniques employed. Aqueous extract in the present study also was found to be very rich in different polyphenolic components, with the details being presented in Figure 1.
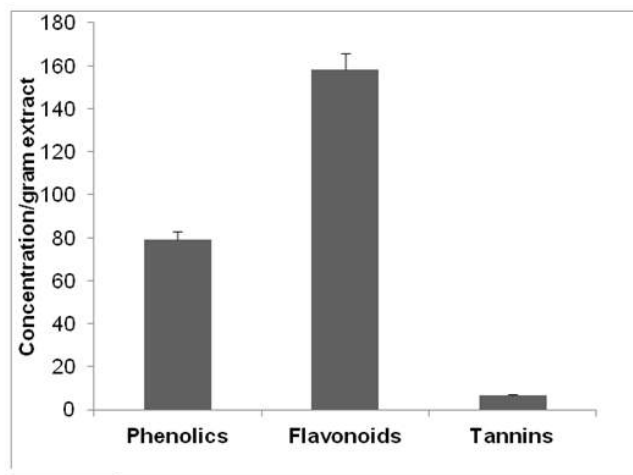
Fig. 1: Evaluations of phenolic, flavonoids and tannin profiles of the plant extract of wheatgrass.

Polyphenol quantification using HPLC

The individual polyphenols present in the plant extract was characterized using HPLC with columns specific for separating the hydrophobic compounds and UV detection at 280 nm as seen in Figure 2 below.
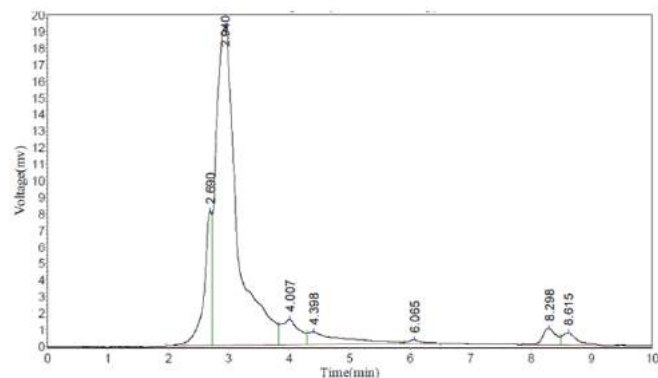
Fig. 2 : HPLC chromatogram for phenolic and flavonoid profile of the plant extract of wheatgrass.

In vitro Antioxidant Activity

The protective antioxidant ability of the aqueous plant extract was estimated in terms of *in vitro* free radical scavenging activity (using H_2O_2 and DPPH), inhibition of NO production and total reductive ability. Details are as shown in Figures 3-5. Results of this proved potential free radical scavenging activity of the aqueous plant extracts of *Triticum aestivum*.

As seen in Figure 3 below, antioxidant activity of the plant extract was compared with that of the standard antioxidant i.e., Butylated hydroxy anisol (BHA); the

inhibition rate is similar at 25 μg/ml. Although a larger difference is seen at 5 μg/ml, it is well within the range. The overall inhibition percentage of AET is seen to be similar to BHA, thus showing that the H_2O_2 radical scavenging activity of AET is similar to that of a standard antioxidant.
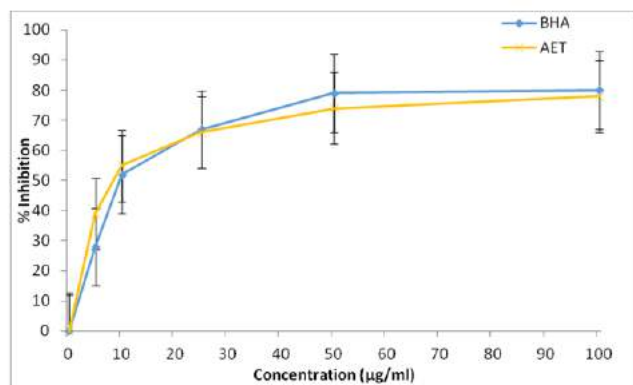
Fig. 3: H_2O_2 Radical Scavenging Activity

DPPH free radical scavenging activity of AET was measured using ascorbic acid as a positive control. Figure 4 represents the inhibition percentage of ascorbic acid and AET at different concentrations. It can be seen from the figure that, AET has a similar DPPH radical scavenging activity as ascorbic acid, thus proving that AET has valuable free radical scavenging activity.
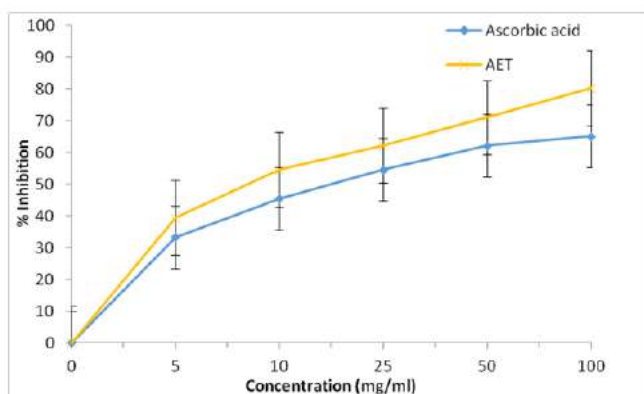
Fig. 4: DPPH Radical Scavenging Activity

A colorimetric assay was performed, to measure the NO radical scavenging activity of AET using ascorbic acid as a control. As seen in Figure 5, the results of the assay show that NO radical scavenging activity of AET is similar to that of a standard antioxidant.

Fig. 5: NO Radical Scavenging Activity

In vitro Antihemolytic Activity

Aqueous plant extract was tested for its antihemolytic efficacy. This study showed the antihemolytic ability of the aqueous plant extract. Data interpreted in Figure 6 indicated that the aqueous plant extract prevents H_2O_2 induced hemolysis.
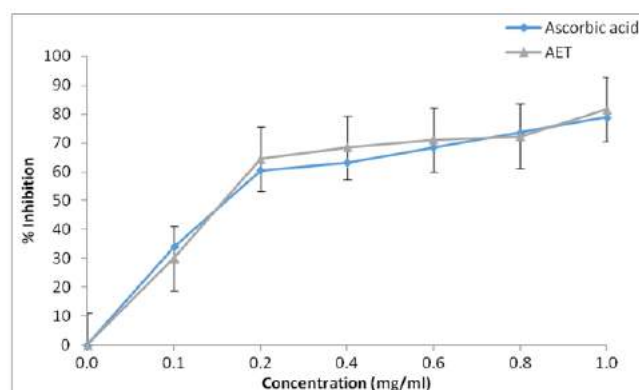
Fig. 6: Antihemolytic Activity

III. CONCLUSION

Free radical induced erythrocytic damage can be prevented through antioxidant and antihemolytic activity. In an attempt to curb such damage, properties of *Triticum aestivum* was explored. The present work clearly depicts that the plant *Triticum aestivum* is a rich repository of phytocompounds. These phytocompounds have been shown to be essential in scavenging free radicals and thus helping maintain the healthy cells in the body. HPLC analysis of the plant has shown the presence of a high concentration of polyphenols. *In vitro* colorimetric assays have proved that the plant has valuable antioxidant and antihemolytic properties. This has also paved way for further research on the therapeutic efficiency of *T. aestivum* against oxidative damage of not only blood but also other tissues and organs using animal and human cell line models.

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Thermophilic and Alkalophilic Amylase from Strain Bacillus Marinus MG 12

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ABSTRACT

A new bacterial strain MG12 with high amylase activity was characterized as Bacillus marinus by morphological characteristics, 16S rRNA sequence homology and molecular phylogeny. Maximum production of amylase by strain MG12 was found in pH 7.0 and 30℃ with an incubation time of 48h. SDS-PAGE and characterization of enzyme showed 57.24 KDa with highest activity at pH 8 and 55℃. The Km and Vmax value for the enzyme activity was found using Line weaver-Burk plot.

Keywords : Amylase, Bacillus, SDS-PAGE, TLC, Kinetics, Specific activity

I. INTRODUCTION

Amylases are group of enzymes have the ability to degrade glycosidic linkage between linked glucose molecules with variety of applications in different industries were isolated (Gupta et al 2003, Mc Tigue et al.,1995). Thermophilic amylases will be useful in different industries (Leveque et al., 2000). Thermo stability is the desired characteristics. High temperature tolerant amylases are available from the mesophilic *Bacillus licheniformis* (Morgan and Priest, 1981), *Bacillus sp.ASMIA* -2 (Teodoro and Martin, 2000). Improvement in strategies to isolate amylases with higher amylase activity leads to the discovery of new α - amylases with industrial applications. The advantage of thermophilic α - amylases are cooling cost can be reduced, solubility of substrates can be increased, lowering of viscosity allows enhanced mixing and pumping and decreases the risk of contamination. The wide range of amylases are acidophilic or neutral. But detergent industry is in a greater need of alkalophilic amylases.

Present study we have isolated and characterized a novel thermophilic alkaline α- amylase producing bacteria designated as MG 12

II. Material and Methods

Microorganism:

In order to isolate amylolytic bacteria, soil samples were collected from the Pichavaram mangrove forest located near Chidambaram, Tamil Nadu. To isolate extracellular amylase producing bacteria, 1g of soil suspension was dissolved with 100ml saline water. Deca times dilutions of soil suspension were plated onto amylase agar, which contain all the components described in Asha eta al 2012 with Starch soluble 0.2%, agar 1.5% at neutral pH was incubated for 72h at 30˚C and observed for zone of inhibition surrounding the bacterial colony due to amylase activity. Using Lugols iodine amylase producing colonies were selected. The physical, morphological and biochemical characterization of strain was determined based on Senath et al., 1986. 16srDNA

sequencing was done to construct phylogenetic tree to find the strain.

Optimization of media for the enzyme production:

Initially the organism was incubated in 1% starch, 0.05% $MgSO_4.7H_2O$, 0.02% $0MgCl_2.6H_2O$, 0.1% K_2HPO_4 at pH 7.0 and 30^0C for 48h. The influence of different pH values (5-10) and temperature (25- 40^0C) for α - amylase production was investigated. Optimization parameters were set based on Asha etal 2012.

Enzyme Assay

The assay was done by Bernfeld method at 50^0C.

Protein Estimation:

Lowry Method with BSA as standard used for protein concentration calculation (Lowry et al., 1971)

Fermentation media, culture conditions and Purification of enzyme:

Enzyme was produced using compositions 1.5% starch, 0.75% Yeast extract, 0.5% $0MgSO_4. 7H_2O$, 0.2 %$MgCl_2.6H_2O$, 1.0 % K_2HPO_4 at pH 7.0 and 30^0C for 30h. Centrifugation has been done to collect supernatant at 15000g for 20min and was used for further studies.

Salt precipitation:

80% (w/v) Ammonium sulphate precipitation was done and kept at 4^0C for 12hand the procedure was as same as Asha et al 2012.

Size exclusion chromatography and HPLC

Size exclusion chromatography and HPLC was done same as in Asha eta al. 2012.

Determination of molecular mass

The purified enzyme molecular weight was measured by performing the procedure of Laemmli (Laemmli, 1970).

Biochemical characterization of purified enzyme:

The influence of pH and temperature on the stability of α -amylase was assayed by using 1.5% soluble starch in a range of different pH and temperature using the methods of Asha et al 2012.

Influence of effectors (metal ions) on the stability of amylase

The influence of 10 mM concentration of different metal ions Mn^{2+} ($MnCl_2$), Fe^{3+} ($FeCl_3$), Mg^{2+} ($MgCl_2$), Zn^{2+} ($ZnSO_4$), Cu^{2+} ($CuCl_2$) and Hg^{2+} ($HgCl_2$) was determined at $55^{\circ}C$ in pH 8.5 for 60 min (Miller et al. 1959).

Kinetics parameters determination

The enzyme (5.58 U/ml) was treated with different concentration of soluble starch (0.5-3.0%) in pH 8.5 at $55^{\circ}C$.

III. Results

Characterization of bacterial strain:

The morphological and physiological properties of the isolated bacteria is in (Table 1). Presence of Bacillus sp. was based on Bergys *Manual of Systematic Bacteriology*. By 16srDNA sequencing and phylogenetic tree analysis the strain was affiliated to *Bacillus marinus*. (Fig.1 & 2)
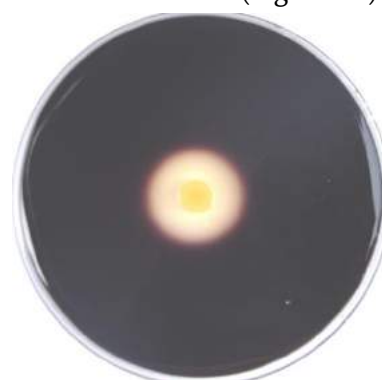
Fig: 1.Amylolytic activity of strain MG12 on starch agar plate.
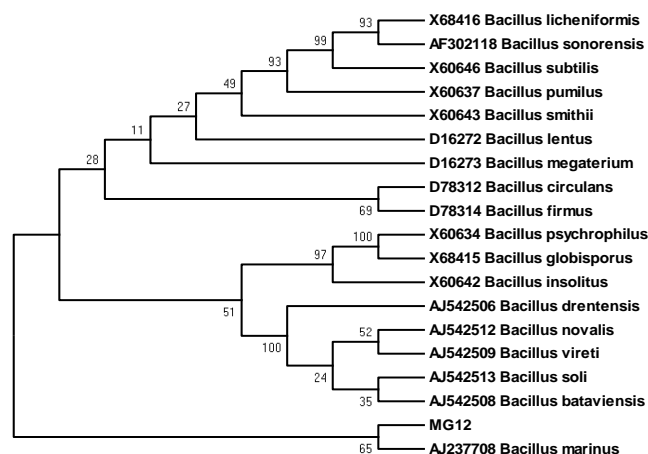
Fig: 2. Phylogenetic tree analysis of strain MG12

Table 1 Identification of microorganism

Physical	
Shape	Gram positive, rods
Biochemical characteristics	
Catalase	Positive
Citrate	Positive
TSI	Positive
Urea test	Positive
Methyl Red	Negative
Oxidase	Negative
Indole test	Negative
Nitrate reduction	Reduced to nitrite
VP test	Negative
Carbohydrate	Acid positive
Presence of NaCl	up to 7%
Growth at temperature	25^0C-65^0C

Hydrolysis of polymer substrates

Starch	Positive
Carboxymethylcellulose	Positive
Lipid	Negative
DNA	Negative
Proteins	Negative

Fermentation and production of enzyme:

The result on amylase production and growth of strain MG 12 with 1% starch as substrate is shown in (Fig 1). The enzyme production and growth were maximum (11.66U/ml) at 30h and was gradually decline up to 48h (Fig 3). Readily available carbon sources are depleted at stationary phase and so effective induction of enzyme was not observed in this phase. (Huang et al;2003, Wanderely et al;2004). α -amylase production by *Bacillus flavothermus*, *Bacillus amyloliquefaciens* and *Bacillus* sp ANT 6 the biomass and enzyme production was increased double fold and highest activity was observed after 24h (Kelly 1997.Hillier 1997,Burhan 2003).But

incase of *Bacillus subtilis* AX20 highest enzyme activity was observed in 34-46h (Najafi et al,2005).
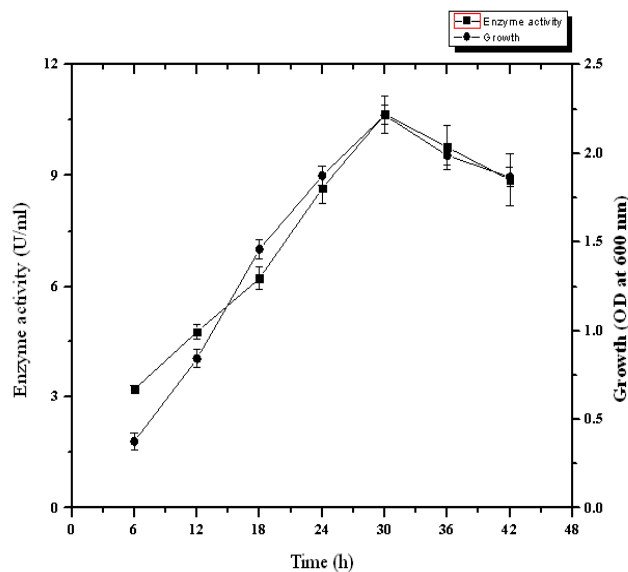
Fig. 3 : Time course induction of amylase production by MG12

The microbe has minimum characteristics in acidic and alkalophilic conditions. The highest production of enzyme and bacterial growth was observed at 7.0. α -amylase have an optimum pH between 6.0 and 9.0 for most of the *Bacillus* strain (Burhan 2003; Castro 1993; Van-Leeuwen and Patel, 1999). In this study the strain MG12 showed higher activities α -amylase (13.89U/ml) at pH 7.0.

Temperature between 25^0C and 35^0C will give production of enzymes (Fig 4). Even though the tested bacteria has the capability to grow in all the temperature but maximum enzyme activity was attained at 30^0C. Different temperature range were reported (Bajpai and Bajpai, 1989; Burhan et al, 2003; Castro et al, 1992; Lin et al, 1998).In this study the highest growth and production of α -amylase (13.11U/ml) was at a temperature of 30^0C.
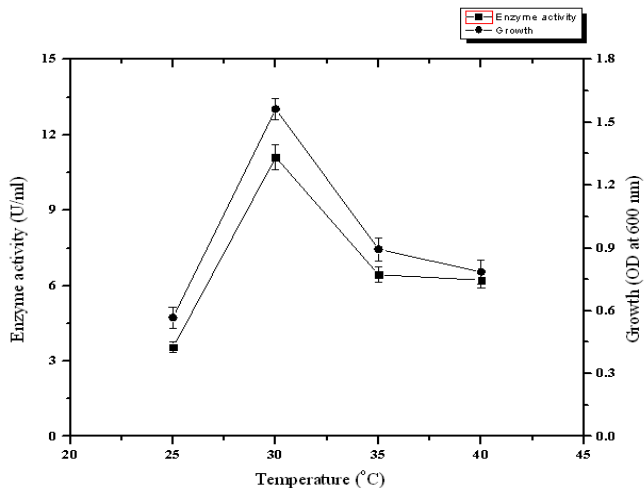
Fig: 4 : Influence of Temperature on enzyme production by MG12

Starch was replaced by readily available carbon. Presence of starch induced the production of enzyme (Fig 5). All other carbon source decreased the production of enzyme. Glucose will suppress the production of enzyme (Lin et al.1998). In 1.5% concentration of starch the strain MG12 showed highest growth (11.66U/ml).
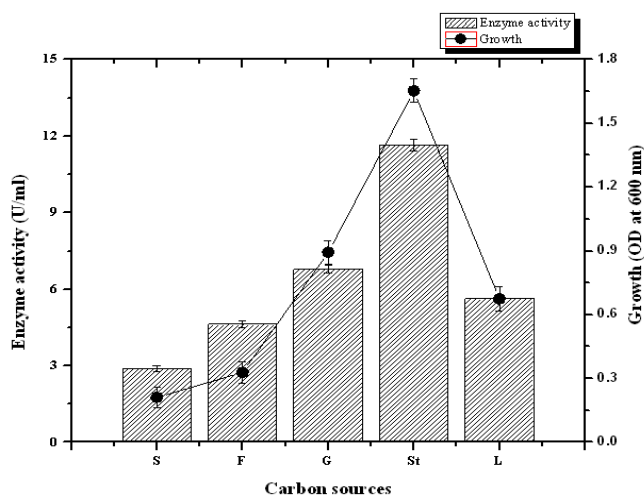
Fig: 5. Influence of carbon sources on enzyme production by MG12

The presence of nitrogen sources significantly influenced the production of enzyme. Presence of 0.75% yeast extract showed maximum growth and production (13.89U/ml). Nitrogen sources like yeast extract and peptone usually have stimulatory effect on enzyme production (Forgatty and Kelly.1980; Hamiltton et al.1999; Hewitt and Solomons.1996). In

the Presence of 0.2% yeast extract induced the production of Enzyme in *Bacillus* sp BKL 20(Kubrak et al.,2010)
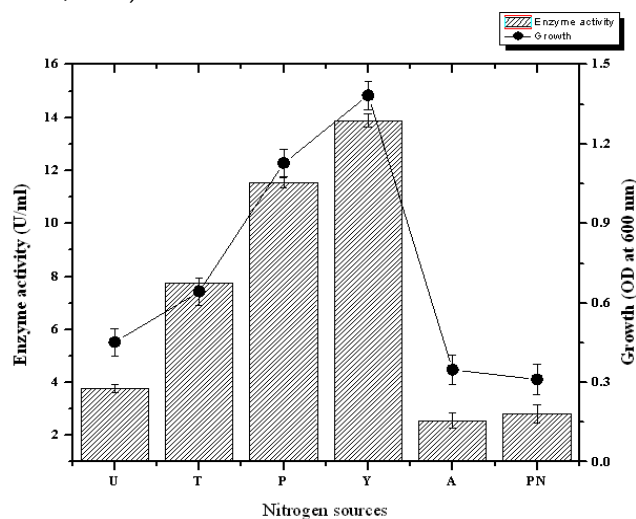
Fig: 6. Influence of Nitrogen sources on amylase production by MG12

Purification and Characterization of amylase enzyme:

MG12 was grown in fermentation media (1000ml) with all the optimized conditions for 48h.The supernatant was collected and partial purification by ammonium sulphate (80%) yielded 26.01%. Purification results are summarized in (Table2).
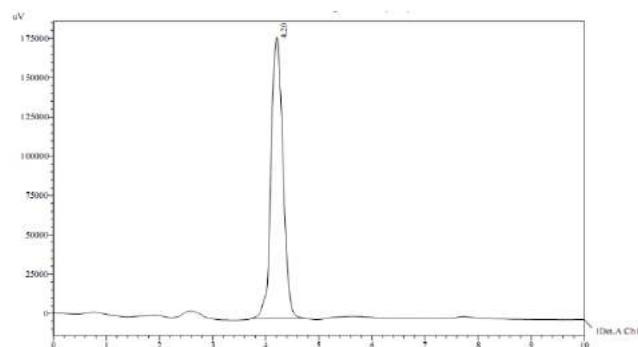
Fig.7. High performance liquid chromatogram of amylase from strain MG12

Table 2: Results of purification from strain MG12

Purification Step	Volume (ml)	Enzyme activity (U/ml)	Total activity (U/ml)	Total protein (mg)	Specific activity (U/mg)	Yield (%)	Fold
Crude Extract	960	12.66	12153.6	7872	1.54	100	1
(NH₄)₂SO₄ Fractionation	425	7.44	3162	1020	3.06	26.01	1.98
Sephadex G-50	125	6.33	791.25	112.5	7.033	6.51	4.58
HPLC	40	5.58	223.2	18	12.04	1.83	7.93

The relative molecular mass of the enzyme was found to be 57.26kDa. The molecular weight of amylase enzyme produced by the strain *Bacillus* sp YX was found to be 56kDa (Liu et al., .2008). The raw starch degrading enzyme from *Bacillus amyloliquefaciens* was found to be 58kDa (Gangadharan et al., 2009).
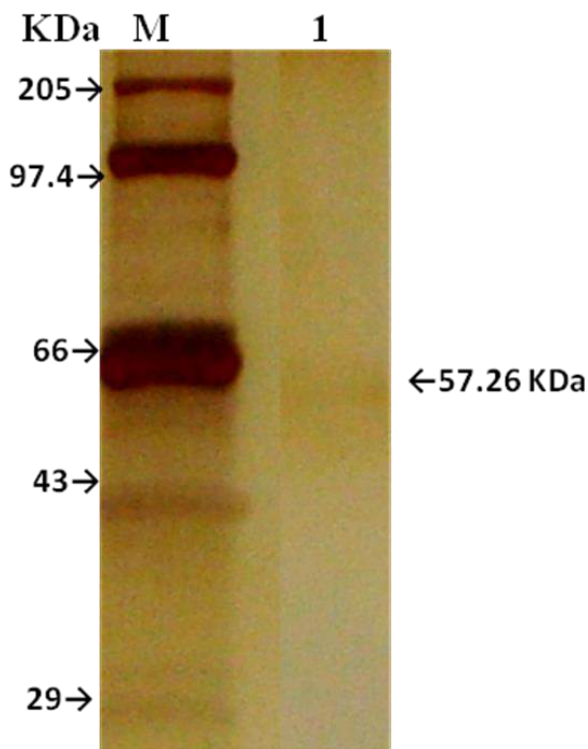
Fig: 8. SDS PAGE of amylase from MG123

Activity of pH tolerance of amylase enzyme

Optimum activity was at a pH of 8.0. The activity of enzyme gives an inference to its alkalophilic nature. Alkalophilic amylase enzymes have proved several industrial applications.

Activity of temperature tolerance of amylase enzyme

Optimum activity at 55^0C at a pH of 8.0. The activity of enzyme gives an inference to its thermophilic nature. Alkalophilic and thermophilic amylase enzymes have proved several industrial applications. (Fig 9)
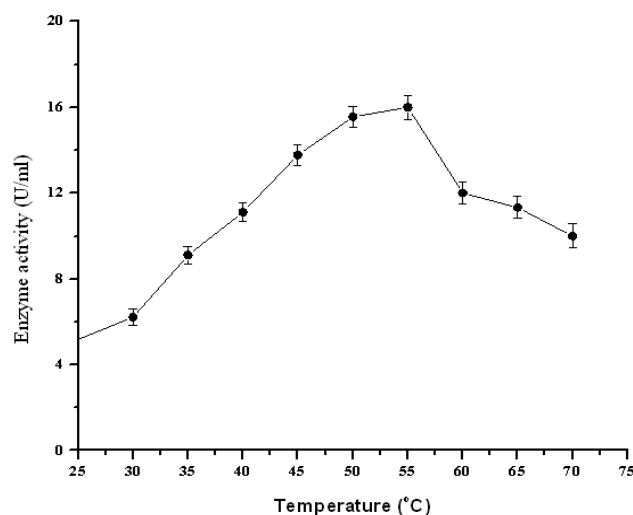
Fig: 10. Influence of temperature on amylase activity

Activity of cations and anions in amylase activity

The influence of cations and anions on activity of enzyme was measured in 10mM concentration, and presence of Fe^{3+} ion gave more activity. This result indicates that the amylase enzyme produced by MG12 is a metalloenzyme (Fig 10).
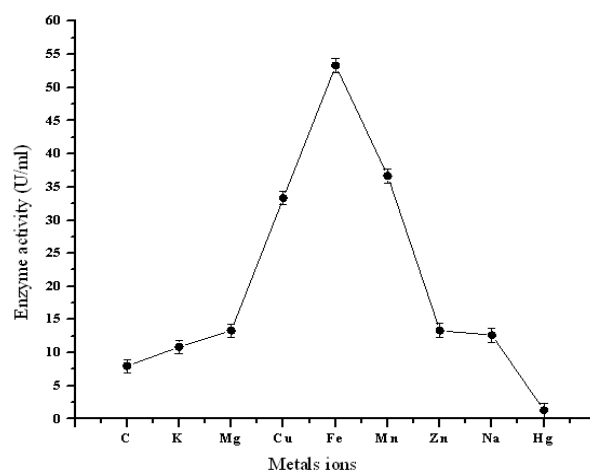
Fig: 11. Effect of metal ions in amylase activity

Calculation of kinetics constant

(Fig. 12).
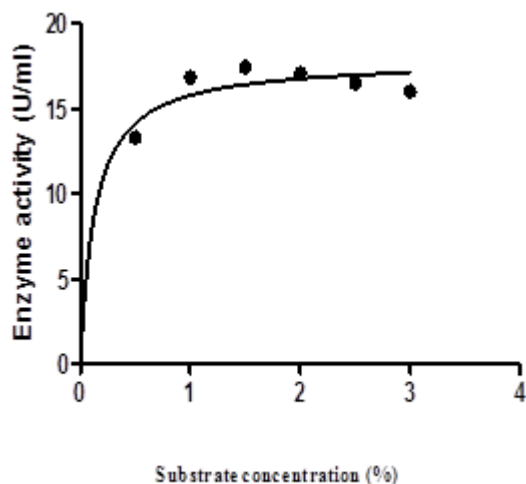
Fig. 12 Michaelis-Menten plot

Km: 0.1327, Vmax: 17.89 and Slope: 134.815 (Vmax/Km)

Km and Vmax were calculated from Lineweaver-Burk plot using initial reaction rates for different soluble starch concentrations (0.5% - 3.0%) at 55°C (Fig. 13).

Best fit values: Slope: 0.0038

$X_1 = 1.0$, $X_2 = 0.5$, $Y_1 = 0.0546$, $Y_2 = 0.0527$, 1/Slope (X/Y): **263.15**
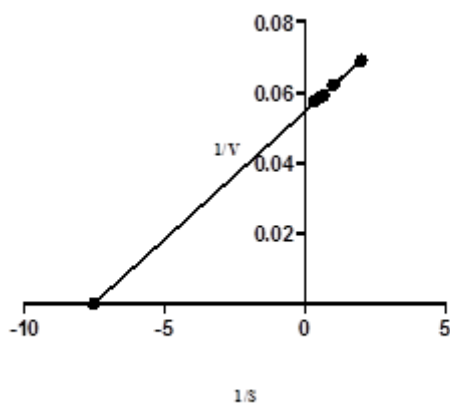
Fig. 13 Lineweaver-Burk plot

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Exploration of lipid extracted residue of algae biomass as a potential feedstock for biogas generation: Sustainable approach towards integrated bio-refinery

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ABSTRACT

Algae biomass has been recognized as a potential and promising feedstock for biodiesel production. However, the expenses associated with the overall downstream processing steps question the sustainability of algae biodiesel. With an aim to improve this, a sustainable approach has been explored using lipid extracted algae biomass (LEB) of Spirulina platensisas the feedstock for biogas generation. The alternate use of LEB for biogas generation showed the maximum biogas generation of 400 cm3/g of total solids for the total period of 70 days. The volume of biogas generated under the similar experimental conditions using original algae biomass as feedstock was in the similar range as observed with LEB. Theoptimistic results obtained from the study suggested that LEB can definitely be exploited for such applications to improve the overall cost economics of algae bio-refinery.

Keywords : Algae, adsorbent, biogas, dye, wastewater

I. INTRODUCTION

The world is presently confronting the twin crises of fossil fuel depletion and environmental degradation. Indiscriminate extraction and lavish consumption of fossil fuels have led to reduction in underground-based carbon resources. Developing countries are in critical energy crisis. The present energy scenario has stimulated active research interest in non-petroleum, renewable, and non-polluting fuels [1, 2]. Alternative resources to the fossil fuels have been sought to mitigate these issues, and various renewable resources have been or are being explored which include solar, wind, geothermal and biomass resources. Among these renewable, biomass energy derived from algae is the potential candidate which can be processed for energy and fuels [3, 4].Algae are the photosynthetic organisms which derive solar energy and carbon dioxide from the atmosphere to form their biomass [5]. They range from unicellular to multicellular, microscopic to gigantic kelps and spherical to filamentous. Algae are considered as good candidate for production of biodiesel due to several reasons like high photosynthetic effectiveness, rapid growth, and high biomass productivity [6, 7, 8, 9]. Algae grow faster than fastest growing terrestrial plant, switch grass. The yield of algae biomass per acre is 200 times above as compared to the yield of the finest performing terrestrial plant [10]. Some algae species can even complete their growing cycle in few days [11].A lot of work can be found in literature dealing with the utilization of various waste materials, such as seed/fruit shells, crop straws, agricultural wastes, fruit peels, etc. for various uses. The production of biogas from various waste materials has also been investigated in many studies

reported in literature. Very little information on similar applications of residual algae biomass left after biodiesel production have been reported. A huge amount of residual biomass is left after oil extraction and transesterification. The efficient and eco-friendly utilization of this biomass is essential to overcome the problem of solid waste disposal, which as a result also enhances the sustainability of biodiesel produced.

II. MATERIALS AND METHODS

A. Materials

The algae biomass of *Spirulina platensis* (ASP) in dried and powdered form was procured from the local supplier. The gas samples collected from the digester were analyzed using gas chromatograph (Agilent Technologies 7890 A Agilent GC system) equipped with thermal conductivity detector and Porapak Q column at 250°C and 25°C respectively. The pH of the digestor contents was determined using a pH meter (Systronics 802) and was maintained using diluted hydrochloric acid or sodium hydroxide.

B. Methods

- Pretreatment of lipid extracted algae biomass (LEB)

For the study, the LEB which is lipid extracted algae biomass of *Spirulina* obtained after in-situ transesterification of algae biomass for biodiesel production, was utilized as a precursor feedstock for the generation of raw biogas. The biomass of LEB was collected, washed with water with an aim to remove any unwanted chemicals which was followed by the sun drying. The LEB was then treated in a hot air oven for further drying, grounded and finally sieved (50–100 BSS mesh). The final product was now used as feedstock for biogas generation.

- Experimental set-up

The experimental setup consisted of three plastic containers (Fig. 1) 7 litres each, as batch digesters to carry out anaerobic digestion of the substrate for biogas generation. The biogas generated was collected and measured via water displacement method. The LEB collected used as a substrate for biogas generation. The original algae biomass (ASP) of *Spirulina,* was also used as a substrate to compare the findings with those obtained with LEB. The proximate analysis of the substrates was conducted to determine the volatile matter and the total solids present in them. The total working volume of the digester was maintained as 4 litres while the total solid content for the digestion was kept at 10%. The digester was initially fed with the fresh cow dung for starting up the digester, as cow dung has inherent bacteria which are essential for anaerobic digestion. This time period between the feeding of the digester with cow dung and start of smooth stable operation of the digester was achieved in about 25-30 days. After achieving the stable conditions, as indicated by no further generation of biogas from cow dung present in digester, the substrate slurry along with the inoculum was added to the reactor. The pH of the digester was maintained at 7. The inoculum concentration was kept at 10 % to the total working volume of digester. The substrate slurry was prepared by mixing it with water in the ratio of 3:1(water: substrate on weight basis). The experiments were performed for the total period of 70 days and the temperature of the digester was maintained at 35 ± 2°C with the help of heating tape. The gas samples were collected every 3-4 days and analyzed using gas chromatograph (Agilent Technologies 7890 A Agilent GC system) which was equipped with thermal conductivity detector and Porapak Q column at 250°C and 25°C respectively.

Fig. 1. Pictorial view of biogas reactor

III. RESULTS AND DISCUSSION

Table 1 shows the composition of air-dried biomass samples of ASP and LEB. The percentage of volatile solids present in both the biomass were found to be in considerable amounts making them quite useful as the substrates for biogas generation. Figure 2 shows the comparison of variation of biogas generation with time (days) using ASP and LEB as substrates. It can be observed in both the cases that initially biogas production was slower but after 15 days the generation became significant which continued until 45 days and then reached equilibrium. After the period of 45 days, the biogas production became stagnant due to the decrease in available nutrients in the medium which could have disturbed the growth of bacteria, thereby affecting the biogas production Figure 2. also shows that the volume of biogas generated under the similar experimental conditions using ASP as feedstock was in the similar range as observed with LEB. The maximum production of biogas obtained was 400 cm³/g of total solids for the total period of 70 days using LEB as a substrate.

Table 1. Composition of air-dried feedstock for biogas generation

Parameters (%)	ASP	LEB
Moisture	5.2	7.42
Total solids (TS)	94.8	92.58
Volatile solids (%age of TS)	74.41	70.4

IV. CONCLUSION

The alternate use of LEB for biogas generation showed the maximum biogas generation of 400 cm³/g of total solids for the total period of 70 days. The volume of biogas generated under the similar experimental conditions using original algae biomass as feedstock was in the similar range as observed with LEB. Henceforth, summarizing the entire results of the study conducted it can be concluded that algae biomass left after lipid extraction for biodiesel reduction has the immense potential to be the alternate feedstock for biogas generation. It can concluded from the study that the factors questioning the sustainability of algae biodiesel can be reversed by focusing the research on utilizing the remaining carbon and hydrogen in the biomass for energy generation and secondly by extracting the value added products from the remaining biomass, thus reducing the overall downstream processing costs of biodiesel production and strengthening its economic viability.
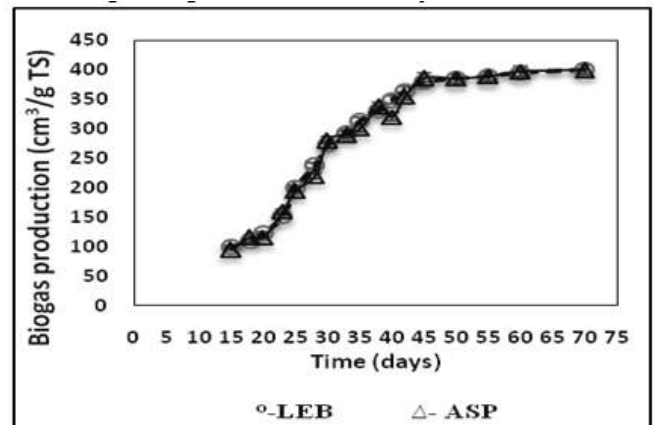
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Synthesis and Characterization of Metal Oxide Nanocomposites; Application in Electrochemical Detection of Neurotramsmitter

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ABSTRACT

ZnO-NiO nanocomposite(NC) has been synthesized by co-precipitation method. This ZnO-NiO composite has been characterized by using, x-ray diffraction (XRD), scanning electron microscope, (SEM). The synthesized composite exhibited a good sensing property and applied for the electrochemical detection of a neurotransmitter, dopamine (DA). ZnO-NiO modified carbon paste electrode (MCPE) showed good catalytic property towards the oxidation of DA. The developed nanocomposite sensor offered high catalytic activity in sensing the dopamine MCPE application in the development of biosensors. The electrochemical responses of $5\times10{-5}$ M DA and recorded voltagramm at the potential range of -0.2 to 0.6 v vs. SCE in the 0.2 M phosphate buffer of pH 7.2 by Cyclovoltametric technique for both bare carbon paste electrode (BCPE) and MCPE. A good linearity has been observed between scan rate (v) and redox peak current for ZnO-NiO composite MCPE with correlation coefficients of R = 0.97811. These results indicated that electron transfer reaction is adsorption controlled. Therefore, ZnO-NiO nanocomposite could serve as an alternative material as sensor material for the electrochemical detection of dopamine.

Keywords : Dopamine, Nanocomposites, Modified Carbon Paste Electrode, Cyclic voltammetry.

I. INTRODUCTION

The scenario at present across the globe is paying much attention for sensitive detection of the neurotransmitters. There has been considerable interest in developing electrochemical techniques have been proven to be significantly advantageous to biosensors and sensing the electrochemical detection of biomolecules [1-6]. Among different semiconductor metal oxide materials as the nanocomposite sensor offered high catalytic activity and blended oxide permit the possibility of tuning their materials properties according to the necessity for novel application [7-12]. Numerous mixed metal oxide nanoparticles, among that mixed ZnO and NiO nanocomposites (ZnO-NiO'NCs) got extraordinary interests because of its lower expense, higher selectivity, high catalytic activity and the modification of an electrode with ZnO-NiO' NCs can shift voltametric peaks in an analytically useful manner [13-20]. Dopamine (DA) belongs to a member of the

catecholamine family it is a neurotransmitter plays an important role in the functions of the central nervous system and neurological disorders [21, 22]. The amount of dopamine decrease in the brains of patients causes Parkinson's disease and DA played an important role like neurotransmission involves the conversion of an electrical impulse to a chemical event [23, 24]. The developed mixed oxide ZnO-NiO nanocomposites by precipitation method are used for MCPE to study voltametric detection of DA.

II. EXPERIMENTAL

A. Materials and Methods

The sodium hydroxide, NaH_2PO_4, Na_2HPO_4, triton X-10, Dopamine hydrochloride, graphite powder, silicone oil, $Zn(NO_3)_2.6H_2O$ and $Ni(NO_3)_2. 6H_2O$ were purchased from SD Fine chemicals, Mumbai, India. The stock solution of 25 mM of dopamine was prepared in 0.1 M perchloric acid, phosphate buffer of pH 7.2 prepared in double distilled water.

B. Preparation of ZnO-NiO nanocomposite

Co-precipitation method has been followed for the preparation of ZnO-NiO nanocomposite. To the cleaned beaker 0.1 $molL^{-1}$ of 1:1 $Zn(NO_3)_2.6H_2O$ and $Ni(NO_3)_2. 6H_2O$ were dissolved in water about 40 $molL^{-1}$ triton X-100 was added as capping agent. The NaOH (precipitant) was added slowly to the stirring solution until precipitate appears. The resultant was centrifuged, dried and then powder was further heated to 140°C.

C. Instrumentation

CH Instruments, Austin, USA (CHI 660D) was used for the measurements of cyclic voltammogram. A conventional three electrode system was employed, which consists of a ZnO-NiO modified carbon paste electrode as the working electrode; a saturated calomel electrode (SCE) (reference electrode) and platinum wires (auxiliary electrode) to measure current. XRD patterns were obtained on a Bruker D2Phaser XRD system. SEM was studied using scanning electron microscope (JEOL JSM 840).

D. Preparation of BCPE and ZnO-NiO'ncs MCPE

The bare carbon paste electrode (BCPE) was prepared by addition of appropriate amount of silicon oil and graphite powder and mixed in a mortar to develop a homogenous mixture. The paste was then packed to teflon tube and then smoothed on a emery paper. The copper wire was pierced in to it, dried and used. In the same way ZnO-NiO composite was added appropriately and fabricated ZnO-NiO modified carbon paste electrode.

III. RESULTS AND DISCUSSION

A. Characterization of ZnO-NiO'NCs

The prepared ZnO-NiO'NCs has been subjected for XRD studies, and the XRD pattern is shown in Figure.1. The diffraction peaks like 31.7, 34.4, 36.2, 47.4 are the peaks attributed to ZnO (JCPDS file 80-0075) nanoparticles. On the other hand, it is clear from the diffraction peaks at 43.2, 62.8, 75.1 for NiO (JCPDS -78-0429). The dominance of ZnO over NiO is clearly seen. XRD also shows that ZnO-NiO'NCs is a mixture of two phases: a ZnO-based wurtzite phase and a NiO-based cubic phase with the rock salt structure this confirms the formation of ZnO-NiO'NCs [25]. The sharp diffraction peak in the XRD pattern indicates the crystalline nature and the average crystallite size were found to be 14 nm. Figure.2. shows the SEM micrographs of ZnO-NiO. It demonstrates the interconnected ultrafine particles with nano-sized dimension with agglomeration.
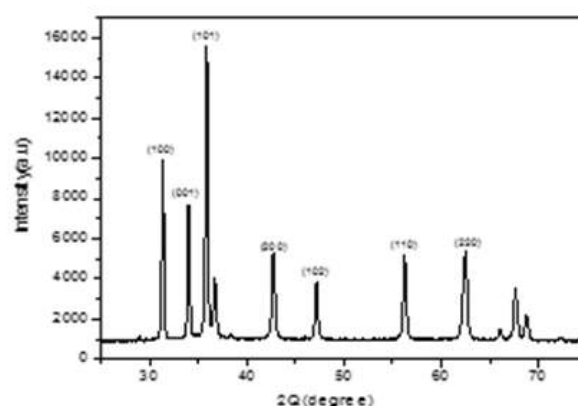
Figure 1. XRD pattern of ZnO-NiO'NCs
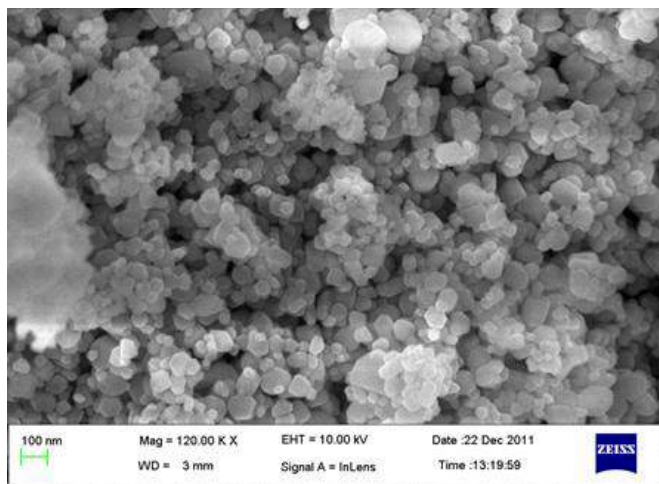
Figure 2. SEM micrographs of ZnO-NiO NC

The chemical composition of ZnO-NiO'NCs was studied by EDX examination. Figure.3. shows EDX spectrum of ZnO-NiO NCs with the insight of wt% of the elements. The compound investigation of the arranged nanocomposites measured by EDX examination demonstrates that just Zn, Ni and oxygen signs have been distinguished, which demonstrated that the nanocomposites are for sure comprised of Zn, Ni and oxygen.
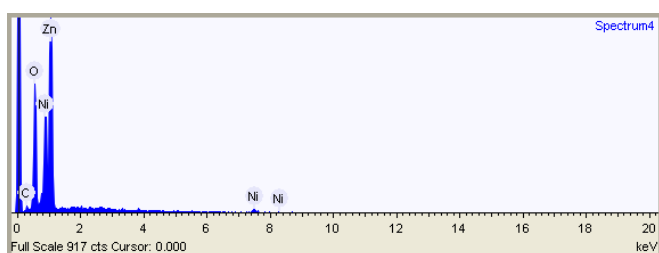
Figure 3. EDX pattern of ZnO-NiO NCs

B. Electrochemical study of DA at BCPE and ZnO-NiO NCs MCPE

The CV studies of 5×10^{-5} M DA in the potential range of -0.2 to 0.6 V in the 0.2 M PBS of pH 7.2 were measured at ZnO-NiO'NCsMCPE. The comparable peak potential differences ΔEp 0.1136 V for the ZnO-NiO'NCs MCPE are shown in Figure 4. At the BCPE the Epa 0.1046 V and the anodic peak currents significantly increased at the ZnO-NiO'NCs MCPE with the anodic peak potential 0.1100 V respectively.
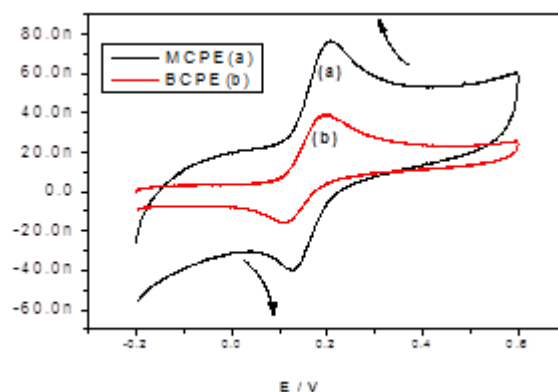
Figure 4. CVs in 0.2 M PBS, pH 7.2 at BCPE and ZnO-NiO'NCs MCPE of DA with scan rate 50 mV s⁻¹.

The result indicates ZnO-NiO'NCs exhibit good electrocatalytic activity than BCPE. Based on the Table .1 results from this study, it is very clear the metal oxide can be effectively used as alternative MCPE for electrochemical sensor for the detection of dopamine and DA undergoes oxidation to form dopaquinone as shown in scheme 1.

Table 1. Comparison of the corresponding peak potential differences ΔEp of different modified electrodes of various metal oxides synthesized

Electrode	Synthesis method	ΔEp, V	Technique	References
CuO/MCPE	Hydrothermal	0.1405	CV	26
TiO₂/MCPE	Precipitation	0.0487	CV	27
ZnO-CuO/MCPE	Hydrothermal	0.0473	CV	28
NiO/MCPE	Hydrothermal	0.1145	CV	29
GO-CuONCS/MCPE	Modified Hummers	0.0802	CV	30
ZnO/MCPE	Hydrothermal	0.0816	CV	31
ZnO-NiO/MCPE	Precipitation	0.1136	CV	**Present work**
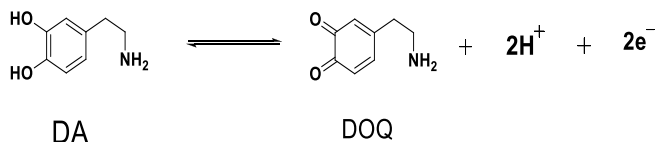
Scheme 1: Plausible mechanism of oxidation of dopamine

C. *Effect of scan rate*

The result of scan rate influence on the CV studies for peak current of DA in PBS at pH 7.2 at ZnO-NiO'NCs MCPE. Figure. 5 show an increase in the redox peak current I_{pa} 4.8 A at a scan rate of 0.005–0.250 V s^{-1} for ZnO-NiO'NCsMCPE. The graph obtained exhibited good linearity between the scan rate and the redox peak current (Figure. 7) for the ZnO-NiO'NCsMCPE with correlation coefficients of R^2 0.978, which indicates that the electron transfer reaction was adsorption -controlled process.
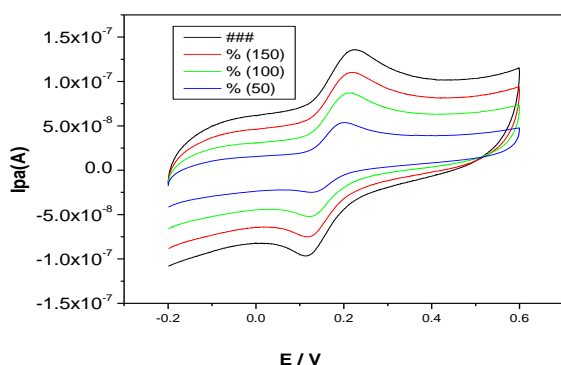
Figure 5. CVs of MCPE in 0.2 M PBS containing 5×10–5 M DA at different scan rates.
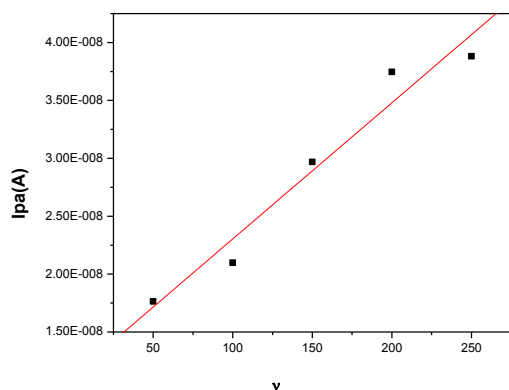
Figure 6. Graph shows the linear correlation between the Ipa and scan rate.

D. *Interference study*

The determine of several extraneous species as interfering compounds with the study of DA in DHI solution was investigated and allowance limit is defined as the upper limit concentration of interfering species that cause an estimated relative error of ±5% for the finding of DA. After the CV studies, we found no major disturbance for the finding of DA in the chosen compounds CaCl$_2$ 4000 μM, NaCl 4000 μM and KCl 5000 μM. Electrochemical response as the peaks remains unchanged after successive 20 cyclic voltammetric scans, confirms ZnO-NiO /MCPE has good stability.

IV. CONCLUSIONS

Simple co-precipitation method has been used for the synthesis of ZnO-NiO metal oxide nanocomposite and characterized by different analytical techniques. This nanocomposite has been used as modified carbon paste electrode for the electrochemical detection of dopamine. ZnO-NiO nanocomposite exhibited enhanced sensing property compared to ZnO nanoparticle alone. The composite exhibited no interference in tables during dopamine sensing. It is expected that it's good electro catalytic behavior the ZnO-NiO'NCsMCPE application in the development of biosensors and electro analytical chemistry. Due to the high stability and repeatability of the ZnO-NiO'NCsMCPE, it has the potential for the future development of nano sensors for clinical research.

V. ACKNOWLEDGEMENTS

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Green synthesis and Characterization of ZnO Nanoparticles using Sterculia Foetida Leaf extract and its Photocatalytic Activity

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ABSTRACT

Zinc oxide nanoparticles (ZnO NPs) were prepared using zinc nitrate and Sterculia foetida (S. foetida) leaf extract as fuel by solution combustion method at 400 oC. The obtained material was characterized by UV-Vis, FT-IR, powder X-ray diffraction (PXRD), Energy dispersive X-ray analysis (EDAX) spectroscopy and morphological studies were carried out by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The PXRD result shows that, the average size of the synthesized ZnO particles are 20.38 nm. The band gap of the ZnO NPs was found to be 3.29 eV. The SEM image shows the ZnO NPs are spherical in shape and agglomerated. The photocatalytic activity of ZnO NPs was examined by degradation of Methylene blue (MB) under UV light irradiation.

Keywords : ZnO nanoparticles, Methylene blue, Photocatalytic activity.

I. INTRODUCTION

There are many organic compounds hazardous to human and animals such as dyes, pesticides and herbicides released from various industries without any treatment directly in to sea, lake and river water leads to water pollution. Water pollution is one of the most significant problems in the world, since it has an inauspicious effect on the water living organisms and human health [1]. Some standard techniques [2] engaged for the removal of aquatic pollutants suffer from several drawback like more cost, sludge of toxic compounds, environmental pollution and others. The organic wastes, such as dyes, drugs, etc. from aqueous media are degraded using semiconductor materials such as zinc oxide (ZnO) nanoparticles by photocatalytic technique [3]. The band gap energy of ZnO is 3.37eV and has innumerable applications due to its nano and microstructural properties [4-6]. It has found propitious applications in solar cells, gas sensors, UV-absorbers, electronic batteries, etc. [7-10]

There are various techniques employed to synthesize ZnO nanoparticles such as hydrothermal, sol-gel, microwave, wet chemical method [11-13]. The nanoparticles synthesized using plant extracts, i.e. green synthesis methods are simple, eco-friendly and non-toxic. *C. paradise* outer peel extract was used to synthesize ZnO nanoparticles, photocatalytic activity of the above ZnO nanoparticles was carried using methylene blue (MB) dye and it showed 56% degradation efficiency after 6h illumination time against MB dye [14]. The dye sensitized solar cells (DSSCs) use TiO_2 as a photo anode material to achieve high efficiency. Recently, ZnO nanoparticles have been substituted in the place of TiO_2 as a photo anode material, ZnO nanoparticles shows the efficiency up to 6.8% [15]. To achieve high efficiency in DSSCs, ZnO nanoparticles structure and size modification is required.

The present work aims for the synthesis of ZnO nanoparticles using *Sterculia foetida* leaf extract. *S. foetida* belongs to Malvaceae family. It is found in Europe, Africa and Asia [16]. *S. foetida* has anti-inflammatory activity as a CNS depressant [17], anti-obesity [18], anti-fertility [19], anti-oxidant [20]. The synthesized nanoparticles were characterized by various techniques such as UV-Vis, FTIR, PXRD, SEM–EDAX and TEM to check the presence of ZnO and to know about the size of the nanoparticles. The photocatalytic activity was carried out using methylene blue (MB) in presence of UV-light, the degradation efficiency was noticed at various time intervals, decrease in absorbance with time has been recorded.

II. MATERIALS AND METHODS

A. Chemicals Required

Zinc nitrate hexa hydrate and methylene blue were purchased from Himedia Laboratories Pvt.Ltd with 99% purity.

B. Preparation of leaf extract

The *Sterculia foetida* leaves were collected from Bangalore, Karnataka, India. The dust particles were removed by washing it with water and dried in the absence of sun light at room temperature. Then the leaves were powdered mechanically using mixer grinder, sieved and subjected to extraction through Soxhlet apparatus using deionized water for 68 hours. The obtained aqueous solution is concentrated using rotary flash evaporator at 40±5 ℃ under reduced pressure (Buchi, Flawil, Switzerland), then it is dried in hot air oven at 55-60℃, from the dried crude extract small amount is used for the synthesis nanoparticles.

C. Synthesis of ZnO nanoparticles

The ZnO nanoparticles were prepared by solution combustion method using aqueous leaf extract of *Sterculia foetida* as a fuel. In this process 0.1g of crude dried aqueous leaf extract of *Sterculia foetida* and stoichiometric amount of zinc nitrate hexa hydrate was dissolved in 10ml of distilled water and constantly stirred for 10 minutes to get homogeneous mixture. This reaction mixture was kept in a muffle furnace for 10 minutes maintaining the temperature of the muffle furnace at 400±10℃. The material was removed from muffle furnace, cooled to room temperature and the obtained dirty white colored powder sample was stored in airtight container till further usage [21].

D. Characterization

The UV-Visible spectrum of the synthesized ZnO NPs was measured by UV-2301 (Techcom) spectrometer. FT-IR spectrum was recorded organic and inorganic constituents in wavelength ranging from 500-4000 cm^{-1} using IS5 (Thermo Fisher). EDAX analysis was carried out in OXFORD XMX N. PXRD was done in a Panalytical X'pert pro MPD Cu-Kα using nickel filter (1.541Å). SEM analysis of synthesized nanoparticles was carried out by (TESCANVEGA3) instrument. The exact size of the nanoparticles was found through TEM (Jeol/JEM2100) instrument. The photocatalytic activity was done under UV light and the absorbance was measured.

E. Photocatalytic activity

The dye methylene blue was taken for the Photocatalytic activity study of the ZnO NPs synthesized using the leaf extract of *Sterculia foetida*. In this degradation process, 15 mg of ZnO nanoparticles was added to 10 mL dye solution of methylene blue. At a wavelength of 660 nm, the absorbance spectrum of the solution was monitored at different time intervals by using UV-Visible spectrometer.

III. RESULTS AND DISCUSSION

The UV peak was observed at 300 nm for ZnO nanoparticles, phytochemical constituents present in the *Sterculia foetida* leaf extract acts as an reducing agent during the formation of zinc oxide nanoparticles. The broad absorption peak at 300 nm indicates the reduction of Zn^{2+} ions that is confirmed the formation of zinc oxide nanoparticles portrayed in Figure-1a. The FT-IR spectrum was recorded for *Sterculia foetida* leaf extract mediated green synthesized ZnO NPs given in Figure-1b. The broad peak at 3350 cm^{-1} and 2800 cm^{-1} shows the stretching vibrations of N-H groups, which indicates the presence of amino group [22]. The peak at 1650 cm^{-1} assigned for the asymmetric stretching vibration of metal chelated carboxylic groups. The peak observed at 1300 cm^{-1} assigned for the asymmetric and symmetric stretching vibration of –CH$_3$ groups. The peak observed at 800 cm^{-1} confirms the presence of compounds such as poly phenols, carboxylic acid, amino acid and protein [23]. The Powder X-ray diffraction spectroscopy (PXRD) also confirms green synthesized ZnO NPs using *Sterculia foetida* leaf extract shown in Figure-2. The perceived reflection lines around at 2θ=31.8°, 34.47°, 36.25°, 47.4°, 56.6° and 68.0° were assigned to (100), (002), (101), (102), (110) and (103) respectively. In addition, the average crystallite size of ZnO NPs was calculated using the Debye-Scherrer formula [24].

$$D=k\lambda/\beta\cos\theta$$

Where D, k, λ, θ and β are crystalline size, shape factor, wavelength of the X-ray beam, diffraction angle and full width half maximum (FHHM) of the peak respectively. The calculated crystallite size was found to be 20.38 nm.
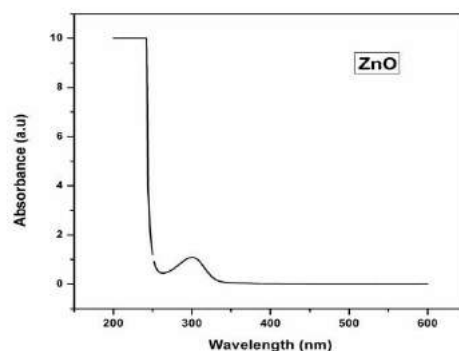
Figure-1a.UV-Vis spectrum of ZnO NPs
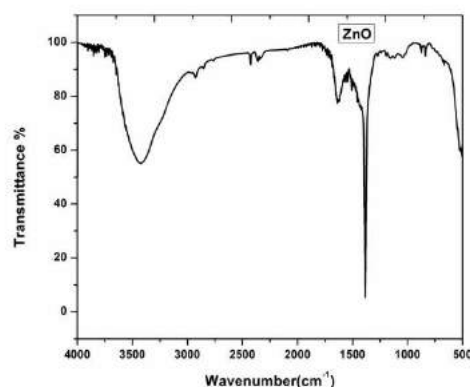
Figure-1b.FT-IR Spectrum of ZnO NPs
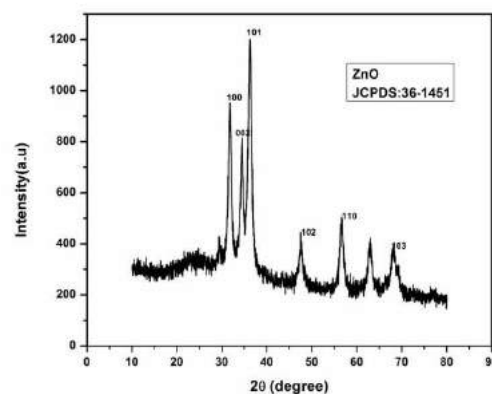
Figure-2.PXRD analysis of ZnO NPs

The EDAX spectra of green synthesized ZnO NPs using *S. foetida* leaf extracts are shown in Figure-3. The zinc and oxygen peaks present in the EDAX spectrum confirms the formation of ZnO NP. The involvement of phytochemical groups was indicated by the carbon peak [25]. The SEM images are shown in Figure-4, synthesized ZnO NPs are spherical in shape and they have shown a number of aggregations

of nanoparticles due to binding with plant extracts. TEM images are shown in Figure-5 which also portrayed the shape of the nanoparticles were in spherical with the size in range of 20-51 nm [26].
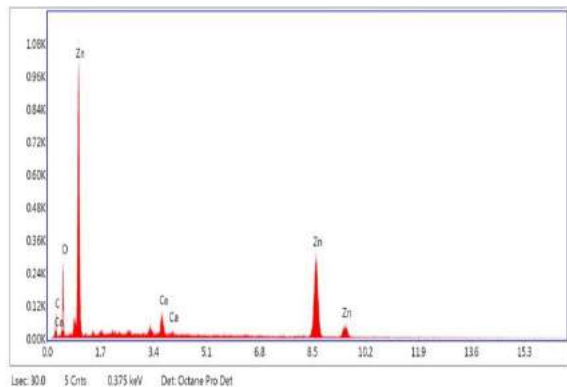
Figure-3. EDAX spectrum of ZnO NPs
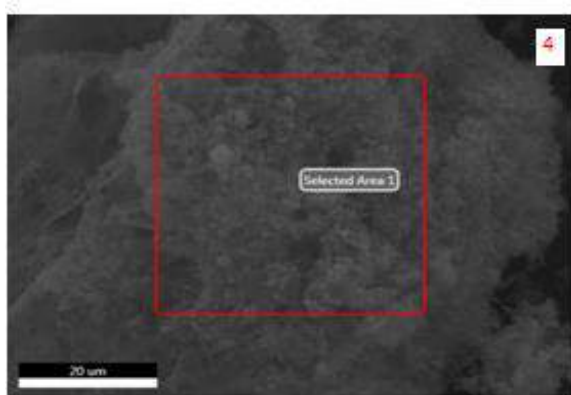
Figure-4 SEM image of ZnO NPs
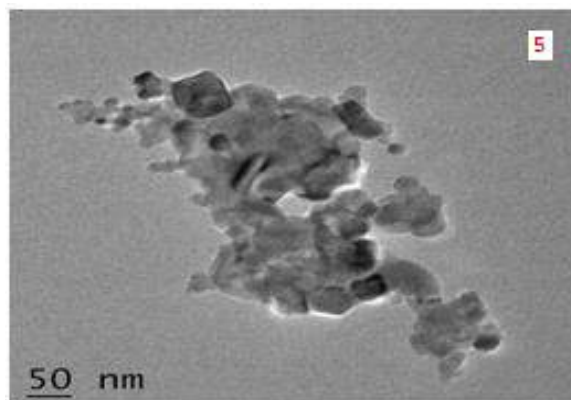
Figure-5 TEM morphological images of ZnO NPs
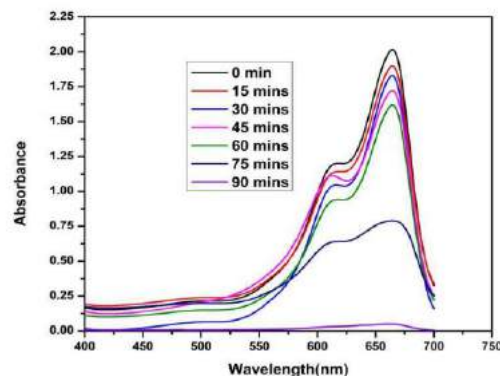
Figure-6.Photocatalytic activity of ZnO NPs for the degradation of methylene blue dye

Methylene blue (MB) dye was taken to evaluate the photocatalytic activity of green synthesized ZnO NPs using *S. foetida* leaf extracts. The absorption spectra of MB solutions in the visible light was recorded and shown in Figure-6. The absorption peak of MB was appeared at 660 nm. The peak becomes weaker as the irradiation time increases this indicates the degradation of the dye molecules in the aqueous solution. The degradation efficiency of the synthesized ZnO NPs against MB is calculated by using the following formula [27].

Degradation Efficiency $\%=C_o-C/C_o \times 100 = A_o-A/A_o \times 100$ C_o is the initial concentration of the dye in the aqueous solution at the time t=0; C is the residual concentration at time t. Relative absorbance=A/A_o, the initial absorbance of the dye solution was represented as A_o and the absorbance after UV irradiation was represented as A.

IV. CONCLUSION

The solution combustion method has been successfully employed for the synthesis of ZnO NPs using *Sterculia foetida* leaf extract. The UV-peak observed at 300 nm confirmed the formation of ZnO NPs. The crystallite size of ZnO NPs was found to be 20.38 nm through PXRD. The agglomeration of ZnO NPs was found in SEM images. TEM images confirm the size of ZnO NPs are in the range of 20-51 nm. The degradation efficiency of green synthesized ZnO

NPs against methylene blue exposed their remarkable photocatalytic property.

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Application of Embedded System in Designing Optimal Signal Cycle for Minimizing Automobile Emission at Signalized Junctions for Better Environment Management

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ABSTRACT

This research paper deals with the improvisation of philosophy of traffic signal cycle time design based on IRC:93-1993 guidelines, which is based on two fundamental parameters i.e. peak one hour traffic flow and recommended saturation flow values obtained from field observations. Webster method is used in the signal design process assuming homogenous traffic as prevailing in developed countries. volume and saturation flow is converted to PCU values. In India the traffic is heterogeneous and this would result lot of unused green time and due to idling of vehicles leading to fuel wastage causing air pollution. Hence, it is proposed to introduce totally a new concept of signal design based on variable traffic volume and variable saturation flow values for each road separately obtained from field studies. These values are installed in the Embedded System of the signal system. The actual signal cycle time, green time and Red time for prevailing traffic volume and saturation flow values at any given time of the day is calculated based on Program installed in the chip. This signal design concept is innovative in nature and avoids excess unused green time for each signal cycle for the entire signal operation period in a day thus resulting in less emission followed by reduction in air pollution.

Keywords : Delay, traffic volume, saturation flow, optimum signal cycle time, air pollution, Embedded System

I. INTRODUCTION

Bengaluru city has more than 350 signalized junctions. All the signalized junctions have varying road geometrics, variable traffic flow and composition, saturation flow characteristics and pedestrian flow across all roads. Traffic flow varies from morning to night making it difficult for the design of signal cycle time. The variation of traffic volume across any junction is figure and this is observed at all junctions in the entire city. It is common practice that the signals are designed based on IRC: *93-1993* guidelines [1]. This code considers only peak hour traffic volume collected from the field and recommended saturation flow values from the standard tables. This fixed value of both the flow the traffic parameter is used in the design of signal phases for all roads of the junctions. This results in lot of unused green time of the signal phases resulting in ineffective use of green time. As the demand for green time varies with the traffic volume and in effective use of green time followed by long waiting time for all the vehicle at the junction. These further results in wastage of fuel thus increasing in air pollution. This happens at all signalized junctions in Bengaluru, and this may be

overcome by using an alternate method of signal design by considering variable flow parameter in signal design equation each time in a block period of 5 minutes. The data for each cycle is drawn from memory of the chip installed in the signal system and each time in block period of five minutes the relevant equations are used for the calculation of green time. The installed embedded system in the signal unit draws the traffic data from the memory chip board and the actual cycle time required is calculated and apportioned into green time required for each road separately. Then the signal phases allocate the green time in proportion to actual traffic volume and saturation flow for every five minutes increment of time, from the time the signal is on in the morning to night. On an average at each junction about 50% of green time is saved in a day for a block period of 5 minutes.

II. Literature Review

Extensive research has been carried out by many Researchers in determining the loss of time or delay at signalized junctions and emissions during waiting for green phase. The reduction in operating speed or waiting at signalized junction is found to increase the fuel consumption, standing delays to vehicles and road users followed by atmospheric air pollution. Following is the brief account of the different types of Research work done in the field of signal design especially in India and also across many countries for both homogenous and mixed traffic conditions. Vehicle emissions are found to cause a lot of health related problems among people due to long time exposure in polluted air at junctions during peak hours of traffic. A detailed account of the studies carried on environmental impact followed by health related problems. .

i) According to California Department of Transportation (Caltrans Varaiya, 2001), if the average speed drops below 35 mph for 15 minutes or more it is defined as congestion whereas in Minnesota, freeway congestion is defined as traffic flowing below 45 km/h for any length of time in any directions (Bertini, 2006). In South Korea, Korea Highway Corporation (KHC) identifies congestion spots where vehicle speeds fall below 30 km/h or traffic congestion continues longer than 2 hours a day that is occurring for 10 days a month. In Japan traffic congestion is defined with respect to free way speed i.e. if freeway travel speed falls below 40 km/h, if there are repeated 'Stop-and-Go' flows for more than 1 km, or if these conditions stay more than 15 minutes. This has been reported in the technical article by Geetam Tiwari [2]

ii) According to Weisbrod and Dewees (1978)., Traffic congestion is a condition of traffic delay because the number of vehicles trying to use the road exceeds the traffic network capacity to handle. A simulation program was used successfully in terms of high accuracy of classifying the road as estimating the external time costs that an additional vehicle using a congested city street imposes on other motorists on that street. This is useful in estimating the burden of congestion on general public and this is reported by Prasanna Kumar[3].

iii) Roy[4] et. al. (2011) worked on a novel and interesting way to detect the congestion on the urban arterials in India. They suggest using a Wi-Fi signal emitting device and a receiver across the road to identify the congestion. This method was found suitable for congested or free flowing roads. Sun Ye (2012) studied congestion charging practice in Singapore and London and developed a scientific plan for public transportation development. Another research was also conducted for Dhaka city; Bangladesh (2013), estimated congestion cost for a year was USD 3.868 billion that includes the cost of environment damage, vehicle operating cost, social cost, travel time cost etc.

iv) Nithya Swaminathan et.al have attempted to design traffic signal cycle timing using simulation technique, based on vehicle actuation that has resulted in 28% savings in time in the form of standing delay compared to fixed time signals.

v)) Bengaluru Traffic Police are working on VAAS-Vehicle Actuated Adoptive Signals on Outer Ring

Road near K.R. Puram and Om Shakthi Temple junction. The real effectiveness of the modified method of signal design based on vehicle actuation is still under observation for further extending the system to other junction locations. The problem with the vehicle actuated signals is that, if in five minutes there are about 120 vehicles arriving on a particular road, then the mean time of arrival is two and half seconds. Fixing this time interval is always a problem in mixed traffic situations. This information is reported by Traffic police in the Annual Report.

vi) Snigdha. S. S (Dissertation Report, DSCE-Bengaluru-78, 2015) has worked on System Delay that is defined the total loss of time at the junction in the form of standing delay is about 1500 hours per day during signal operating duration of 15 hours in a day. The reason for the delay is attributed to the split green time for major roads that results in queuing on major a road as turning of vehicles not allowed during bi-directional vehicular moment. This makes the signal system less efficient. The saturation flow is also found to vary with respect volume of traffic. But this is assumed to be constant in all signal design methods.

vi) Studies conducted (Project Work, DSCE,2019) at one of the busy signalized intersection on Ring Road near Kamakya Theatre indicates that the green phase of the two opposite minor roads is in excess of 50 % as required for the actual traffic volume and saturation flow conditions. It also indicates, the number of signal cycles can be increased from present 324 to 560, almost 80% more than in a day. This indicates, the signals designed based on IRC recommendations may not be very real indicative of the requirement green time for any road in a day during signal operation time. Also, the green time allocated is more than what is required for main roads provided for simultaneous traffic movement. The total cycle time may be reduced from 150 seconds to 90 seconds at any given point of time.

vii) Snigdha .S.S [9] It is estimated that for a medium flow at the junction carrying 65,000 to 75,000 mixed vehicles per day, there is an estimated 1500 hours of delay per day. On the other hand if dynamic or variable traffic volume and variable saturation flow condition are applied and signal phases are designed then , it is possible to save about 50% of the loss i.e. about 750 hours per day. This also amounts to savings of enormous amount of fuel per day in one junction.

3. Effect of Vehicle Emission on Air Pollution and Impact on Public Health

Extensive studies are already conducted across various places about the ill effects of air pollution on human health as reported in references [10,11 and12]. Bengaluru is the 5th largest metropolitan city of India's and branded as one fastest growing metropolises in the world has a rapidly deteriorating environment due to ill planned and inadequate public transport system and road network. The city Transport Service has only between 6,500-7,000 public buses to carry 45% of the city's traffic. Bengaluru has 80 lakhs as registered vehicles under the non-transport category, of which 55 lakhs are two-wheelers. According to KSPCB data, vehicular emission is the dominant source (42%).Bengaluru in this sense poses more of a risk, as several reports have said that the city traffic is the slowest in the country and commuters in the city on an average spend as much as 7% of their time on the road due to poor road network, bad road condition and high density of traffic. In 2005, traffic moved at the speed of 35km an hour; in 2014, it had slowed down to 9.2km. Today, at peak times, the speed is just 4-5km on the city's key Outer Ring Road. At traffic junctions, the wait time is more than five minutes when it should ideally be not more than two-three minutes.

i) According to KSPCB data, $PM_{2.5}$ and PM_{10} particulate matter values have exceeded the National Ambient Air Quality Standards (40 µg/m3) by 3% to 45%, at junctions due to vehicular traffic increase in vehicular delays. The PM_{10} values have also exceeded the National Ambient Air Quality Standards (60µg/m3) by 30% to 120% at junctions. Medical expert opine that particulate pollution gets

absorbed into the bloodstream within a few minutes and is responsible for blocking the arteries leading to heart attacks.

ii) The city has witnessed a phenomenal growth in vehicle population without commensurate increase in either the road space. The WHO ranks air pollution as the 13th leading cause of world-wide mortality, with 527,000 people annually dying prematurely in India due to air pollution. Bangalore is experiencing varying levels of pollution with certain areas having either high or critical levels of the pollutants analysed by Karnataka State Pollution Control Board study. The critical levels of Particulate Matter are likely to have a damaging effect on the health of the citizens in Bangalore that may result in a tremendous burden on the public health system. Also this is affecting the skilled young human resource. This issue of health impact due to air pollution should be addressed by effective and practical measures. The major pollutants constituent is $PM_{2.5}$ and PM_{10} that indicates the mean diameter of particles present in the air that enters through the repository track and gets deposited along wind pipe (Alveolar Region) of the lung. Keeping all the above pints in view, it is absolutely necessary and essential to carry research for immunizing vehicular emissions at junctions by adopting an innovative and advanced method of signal design that can cater to the signal cycle to satisfy variable mixed traffic volume followed variable.

4. Comparison of Existing Method and Proposed Method of signal Design

In the proposed method of signal design the traffic volume and saturation flow data is stored in the Excel sheet format with respect to time of the day in a block period of five minutes and the program draws these values and uses in the equation for calculating optimum cycle length for the junction and apportioned in the proportion of the respective traffic volume on respective roads, including time for pedestrians and Amber time. The complete signal design process is depicted in the following figures.

Fig 1 Plot of Traffic volume Vs Hour of the day indicating variation with respect to time of the day, calculation of signal cycle time for peak hour of the day and calculation of peak hour traffic volume by four fifteen counts and averaged for one hour is also shown to calculate the peak hour design traffic volume. For a given junction it may be either morning or afternoon peak as the case may be. In the present method the design volume is taken every block period of five minutes for the design of signal cycle time to be more on realistic side.
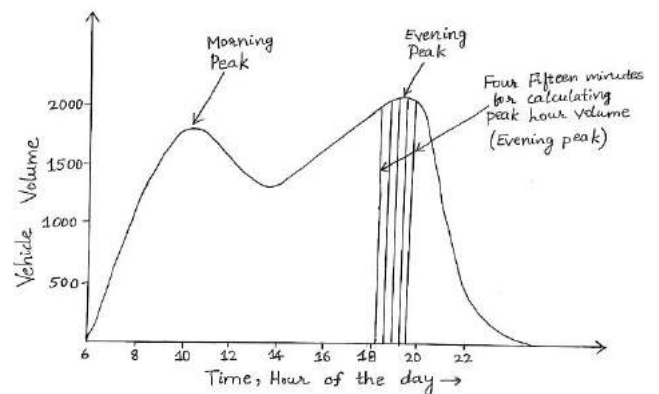
Figure 1: Variation of traffic volume at junctions in a day and peak hour volume calculation.

Fig 2 provided below shows the IRC method of calculating the saturation flow and for a given road width this value is assumed as a constant. The initial lag time during starting delay is normally 2 to 3 seconds is indicated as 'x'. In the tail end of the curve 'y'. Here 'y' indicates saturation head way and at the end of this the vehicles flow freely till the end of green time. In the present modified method, the saturation flow is considered as a variable for calculating value green time in a block period of five minutes.

Figure 2 : Saturation flow — Homogeneous traffic

x : Initial lag during starting and acceleration, sec
y : End of saturation flow and saturation end headway, sec
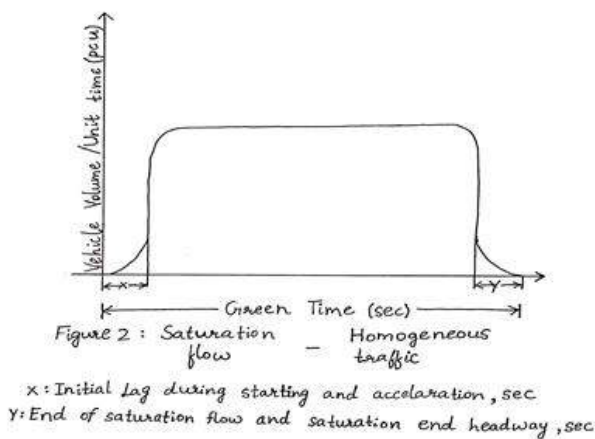
Fig 3 provided below shows the variation of saturation flow in mixed traffic flow situation. This shape of the curve is as observed in the field during data collection. The curve is obtained in a different fashion, as the field data indicates the domination of two wheelers in the accumulated during red phase of the signal in the front and during the green phase the vehicles accumulated would clear fast and hence the observed volume of vehicles the beginning of the green phase and slowly reduces to a minimum. At the end of the green period the vehicles are under free flow condition. That is one vehicle following the other and this condition is called as saturation headway. In traffic system the free flow of vehicles should never be allowed as it may result in rear end accidents due to sudden change to red phase. In the present method this question does not arise as both the volume and corresponding saturation flow are taken as a mean of three values and signal time is calculated as just what is needed for the vehicle volume and corresponding saturation flow value. This would not result in excess green time that may result in free flow like condition.

Stepped value of volume in a block period of five Minutes for signal cycle time calculation and apportioning it to all the roads in proportion to the volume of vehicles waiting for clearance would result in lowest value of green time for each road and the excess of green time would be minimum for each block period of five minutes. This is also indicated in the Fig (1) which shows the variation of traffic volume in a bloc period of five minutes. This method

would totally eliminate the excess of green time due to fixed traffic volume and saturation.

5. Traffic Data Collection and Analysis

This includes study of signal phases from morning to evening for probable change in cycle time during peak hours, study of traffic volume and saturation flow for three cycles in a block period of 15 minutes. Unused green time based on saturation headway as indicated in the figure. Saturation headway is the time headway or inter-arrival time between successive vehicles arrival after platoon movement ends and the vehicles move one behind the other which is termed as lean flow during the end of saturation flow. This value varies from time to time depending on the total number of vehicles that have accumulated during red time and the traffic volume of the road under consideration.

6. Signal Phase Design Based on Webster Method

Based on values of normal flow, the ratio, $y = \frac{q}{s}$ are determined on the approach roads. In case of mixed traffic, the different classes of vehicle volume may have to be converted by multiplying by appropriate PCU values to get volume in PCU. The optimum signal cycle is given as, $C_0 = \frac{1.5L+5}{1-Y}$

Here, L =2n+R and 'R' is phases the total lost time per cycle in second, 'n' is the number is of phases for the junction and for square junction (usually this value 4 for a typical junction that is considered for study), R is the all red time or red-amber time. The green time for a phase is given as $G = \frac{y}{Y}(C_0 - L)$, here Y=sum of 'y' values for all approach roads under consideration. This method uses fixed peak hour traffic volume and saturation flow values.
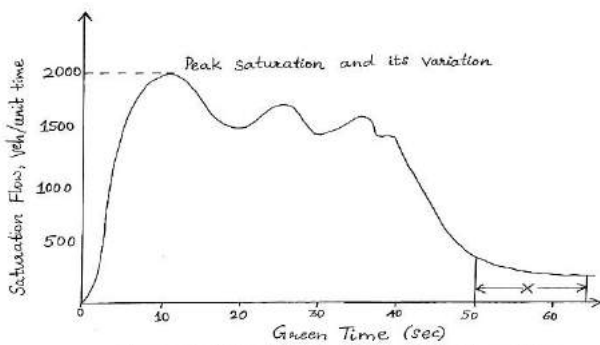
Figure 3 : Saturation flow in mixed traffic condition
x → unused green time | Saturation headway

7. Application of Embedded System in traffic signal cycle design for junctions

An embedded system is the system which has computer hardware with software embedded in it. It is a device which has a programmable computer but not general purpose computer. An Embedded System is controlled by an internal microprocessor or microcontroller instead of an external control unit. Arduino, PIC Microcontroller, 8051 Microcontroller. Atmel Microcontroller are usually used to design embedded systems. In the signal time design for junction, the data may be provided in the format shown in the end and the instructions for the calculation of green time and red time for a bloc period of five minutes is also included and execution of the design of signal phases for all roads may be provided in the table. The data may be provided in the Excel format as shown. Typical sheet containing vehicle flow per unit time, corresponding saturation flow, formulae to be used for the calculation of signal cycle length and computing the green time and red time as required depending on the width of the road and normal walking speed of 1.2 m/sec. The various constants as applicable in the Program may predefined and used accordingly. The controller controls the data flow from source and also time at which a different data set have to be taken for next calculation. The sequence of signal time setting may also be defined in the program. The new set of field data may also be entered in place old data if field situation demands. The table is provided as a typical example wherein, in reality the data format should

be designed as required for the junction depending on the of traffic volume and corresponding saturation flow values. This means the signal time is to be designed based on requirement at the junction. Some junction carrying high traffic volume may have to start at 7.00 AM and may go up to 11.00 PM and the data format should incorporate all such details. The data is provided based on field observations on a normal traffic day as the traffic volume is influenced by week of the day like Monday the day after a holiday, Wednesday is a normal day and Saturday is influenced by the next day holiday. Hence, if the data is able to provide all such needed information, then this would be more successful.
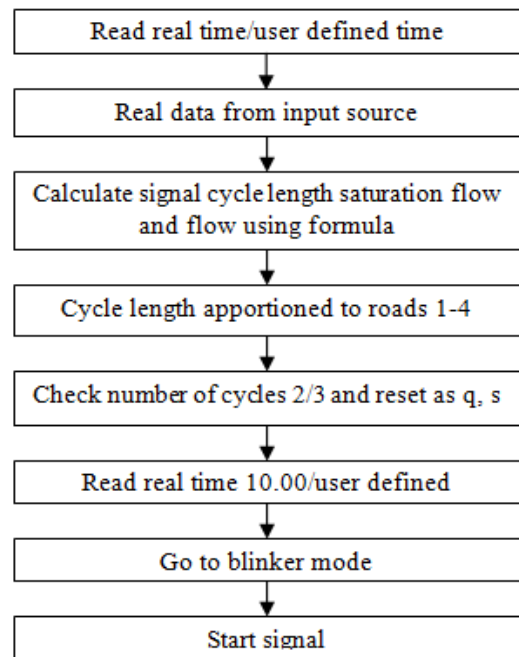
Typical Flow Chart for Traffic Data Flow

Table No.1 Format for Input Data for the design of signal phases in a block period of Five minutes

INPUT DATA FORMAT			
Time of the day	Flow value	Saturation flow	Condition equation
7:00	q_1	s_1	$y1 = q/s$
7:05	q_2	s_2	
7:10	q_3	s_3	$Co = \dfrac{1.5L + 5}{1 - y}$
ǀ	ǀ	ǀ	
ǀ	ǀ	ǀ	
22:00	q_n	s_n	$Y = \Sigma y$
			$G = \dfrac{y}{Y}(Co - L)$

8. Advantages of the proposed method

i) Real time data is used for calculation of cycle time based on actual value as obtained from the field and in no place any assumption is made about the traffic data that makes the green and red time calculation a more realistic one.

ii) No excess of green time is provided for any phase as the calculation is based on actual data at that time.

iii) If the effect of weekday is going to matter, then the table may be further extended to incorporate this.

iv) Overall minimum waiting for vehicles due to less delay and less pollution.

9. Discussions and Conclusions

There is tremendous scope for reducing the vehicle delay at junctions by using variable value of volume and saturation flow in adopting the dynamic values of both volume and saturation flow values in arriving at optimal signal time. For more accurate assessment value of the delay, a block period of five minutes may be assumed. If more accuracy is desired then program real time data may be provided directly to the system from video camera connected to the program.

10. Scope for Further Study

i)   Real time, time headway may be captured for all roads at a junction using high resolution video cameras, followed by real time flow and saturation flow values are worked out and substituted in the relevant equations for calculating actual green time for the for each road separately and assigned to that signal phase for the road.

ii) This concept may be extended for all roads at a junction for each cycle for optimal performance to minimize the delay.

iii) The recommended method of data collection, data storing and using it for real time computation of signal cycle time for all roads at the junction would result in minimizing delay

and also reduced vehicular emission and hence less air pollution.

iv) This logic of signal design may be extended to all junctions using cloud data storage method and computing green time, amber time and total cycle time on real time basis.

v) Calculation of system delay before and after the proposed method may be worked out to calculate the overall savings in productive time, fuel and reduction in pollution due to reduced vehicular emissions.

vi) The study may be extended to the entire city and the loss of fuel has to **assessed** for preventive measures for reduction in time loss and fuel loss for further optimizing each signal location and signal phase. From this nearly half the fuel wasted at signalized may be eliminated.

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Characteristics of Cement Stabilized Masonry Blocks Prepared from Brick Masonry and Concrete Waste - Experimental Study

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ABSTRACT

This experimental study deals with utilization of brick masonry and concrete waste in preparation of cement stabilized masonry block(CSMB). Brick masonry waste and concrete waste are crushed into granular form and designated as brick powder (BP) and fine recycled concrete aggregate (FRCA) respectively. BP and FRCA are used in 70:30 proportions and cement content is varied as 6%, 8%, and 10%. The static compaction method is used to fix the optimum water content as 16% for all the three mixes. The size of the CSMB units is $190{\times}90{\times}90$ mm and it is tested for dry density, wet compressive strength, water absorption and rate of moisture absorption. Correction factors reported in the literature are used to arrive at uniaxial compressive strength. The compressive strength of CSMB units of size 190x90x90 are found to be in excess of 3.5MPa, except for 6% cement content, with correction factor = 0.58. A simple equation is proposed to compute the representative 28 days wet compressive strength of CSMB units without correction factors as f = 0.8 C, with C as % of cement in the mix. The water absorption of CSMB units are within permissible limit of 18%. The rate of moisture absorption of the units is found to follow an exponential trend. Nearly 50% of absorption is found to take place in the first 30 mins of soaking. To study the influence of size, CSMB units of size 290x190x90 mm with 8% cement are cast and wet compressive strength is determined on the cubes 70 mm and 90 mm cut from the CSMB units 290x190 x90 mm, as well as, on the units also. The 70 mm and 90 mm cube samples cut from CSMB units show a decrease of 32% and 35% in wet compressive strength when compared with 70.6 mm cube samples cast from the same mix. The 28 days wet compressive strength of CSMB units 290 x190 x90 mm with aspect ratio as 0.47 is about 70% more than the strength attained with units 190 x90x90 mm with aspect ratio as 1.0.

Keywords : Concrete and brick masonry waste, Cement Stabilized Masonry Blocks (CSMB), Fine recycled concrete aggregate (FRCA), Brick powder (BP)

I. INTRODUCTION

Recycling of construction and demolition waste (C&D) and using in civil engineering applications is a way forward to achieve sustainable construction, as it reduces consumption of natural resources and minimizes landfill. Concrete and brick masonry waste constitutes a major portion of C&D waste in India. It is widely accepted that recycled concrete aggregates can be utilized in concrete mixes as numerous experimental studies demonstrate its reliability. Recycling of brick masonry waste has not driven much attention of the researchers as very few studies are available in the literature. These studies are focused on the production of concrete mixes with brick masonry waste being used as a partial

replacement for aggregates [1, 2, 3, 6] and cement [4, 5, 6]. It has been observed that the low unit weight and higher water absorption, limits the usage of brick waste in the concrete mixes [1, 3, 6, 7]. Poon and Chan [8], concluded the use of 25% crushed clay brick satisfies the compressive strength requirements for Grade B paving blocks as prescribed by ETWB of Hong Kong for the trafficked area. Sadek [9] has prepared a solid cement bricks of different grades using brick aggregates for load bearing and non-load bearing units

Hypothesis and objectives

The authors of the present study is of the opinion that both concrete and masonry waste can be utilized for the production of masonry units by using the techniques adopted for SSB. In view of the experimental evidence outlined in the literature [10-19] with respect to suitable grading and composition of the soil for making SSB, the authors of the present study consider BP recovered from the brick masonry waste has the potential for making blocks suitable for masonry. The masonry waste cannot be easily recovered as pure brick powder, due to the presence of adhered mortar on its surfaces. Hence, during the process of recycling masonry waste, it is natural to expect that the recovered material will consist of brick powder, as well as, a finer fraction of adhered cement mortar. The recycling of concrete waste also generates FRCA, which is largely unutilized. This experimental study is carried out to ascertain the suitable mix composition comprising of BP and FRCA for the production of CSMB units.

Materials and mix constitutents

Physical properties of materials

The 43 grade ordinary Portland cement conforming IS 8112:2013 [20] were used in this study. The properties were tested as per IS 4031 [21, 22, 23, 24, 25, 26]. The physical properties of BP and FRCA were tested as per the procedures specified in IS 2386-1963 [27]. The physical properties of cement,

BP, FRCA are listed in Table I. The gradation curve of BP and FRCA are depicted in Fig.1

TABLE I. PHYSICAL PROPERTIES OF CEMENT, BP AND FRCA

Sl.no	Attributes	Cement	BP	FRCA
1	Specific Gravity	3.08	2.41	2.2
2	Specific Surface Area	-	-	-
3	Standard Consistency (%)	30	-	-
4	Initial Setting Time (min)	80	-	-
5	Final Setting Time (min)	210	-	-
6	Fineness Modulus	-	1.47	2.21
7	Fineness (%)	5.94	-	-
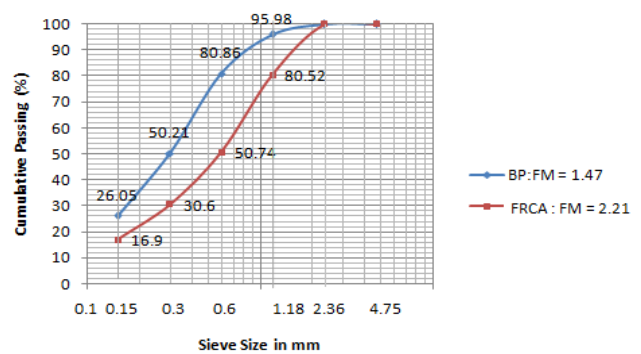
Fig. 1. Gradation curve of BP and FRCA

Chemical composition of BP and FRCA

The chemical constituents of BP and FRCA are listed in Table II.

TABLE II. CHEMICAL COMPOSITION OF BP AND FRCA

Sl.no	Oxides content (%)	BP	FRCA
1	Silicon dioxide (SiO_2)	88.53	68.15
2	Alumina oxide	0.12	0.16
3	Ferric oxide (Fe_2O_3)	5.68	3.08
4	Calcium oxide (CaO)	0.98	14.43
5	Magnesium Oxide	0.75	0.8
6	Loss on Ignition	3.11	13.3

Mix constituents

The basic mix was assumed to consist of BP and FRCA only. Several trial mixes were formulated with BP and FRCA in varying proportions out of which BP and FRCA at 70% and 30% by weight as constituents were preferred from mouldability consideration. Cement content in mixes was varied as 6%, 8% and 10% by weight of the basic mix. Three mixes considered in the study is designated as 6C | 8C| 10C.The mix constituents are listed in Table III.

TABLA III. MIX CONSTITUENTS (KG/M^3)

Mix designation	6C	8C	10C
BP	1190	1190	1190
FRCA	510	510	510
C	102	136	170

Experimental work

The experiments were carried out in three phases. In the first phase, cubes of size 70.6mm were casted for all the three mixes and wet compressive strength at 28 days were assessed. In the second phase, CSMB units of size 190 x 90 x 90mm were casted and it is tested for dry density, wet compressive strength, water absorption and rate of moisture absorption. In the third phase, a CSMB units of size 290 x 190 x90mm were casted to assess the size effects on the compressive strength. The cubes of size 70 and 90 mm were extracted from 290 x 190 x 90mm units and the compressive strength was determined.

Experimental studies on cube specimens

1) Optimum moisture content(OMC)

The water content in the mix influences the strength of CSMB specimens. Higher water content results in formation of capillary pores, consequently reduction in the strength. However sufficient water content is also necessary in order to achieve maximum compaction. Hence, the trail studies were carried out to fix moisture content for each mix.

2) Casting of cube specimens

Dry mix of BP, FRCA and Cement were prepared on the tray. The required amount of water is added and it is thoroughly mixed on the tray using trowel. Seven cubes of size 70.6 mm were prepared by varying moisture content from 13 to 19% by weight of the basic mix for all the designated mixes. The mix were filled into the moulds up to the top and with a collar in place excess material was filled and compacted up to a pressure of 3.0MPa using UTM machine of 1000 KN capacity. After compaction the excess material is removed and the surface is finished with trowel.

3) Determination of OMC

The cubes were demoulded after 24 hours and the weight of each cube is recorded to assess their bulk densities. Next, the cubes were kept in the oven for 24 hours at a temperature of 100±5oC. After 24 hours, the cubes were removed from the oven and it is kept in the ambient temperature and then dry weight is recorded. The dried cubes are then kept in the water for 24 hours to assess their water absorption as well as void ratio and porosity.

4) Determination of wet density and wet compressive strength

Six cubes were prepared for each mix combinations and these cubes were subjected to intermittent spray curing for 28 days. After curing, the cubes were tested for wet density and wet compressive strength as per IS 3495 (Part1): 1992 [29].

Experimental studies on CSMB Units

The block size of 190 x 90x90 mm were considered for casting CSMB units. This is the one of the sizes recommended in IS 1725: 2013 [28]. To assess the size effects, the CSMB units of size 290 x 190 x 90mm was cast.

5) Casting CSMB units

The procedure as outlined in section A.2 is followed to cast the CSMB units. Spray curing is employed for

28 days and the wet gunny bags is covered throughout the curing period.

6) Testing of CSMB units

Six CSMB units were tested for dry density, wet compressive strength, water absorption and rate of moisture absorption. The description of testing procedure along with the standards followed is discussed in the following section.

Dry density

The dry density of the CSMB units were tested as per the guidelines outlined in IS 1725:2013 [28]. The CSMB units were kept in the oven at a temperature of 100 ± 50C for 24 hours. Later the units were cooled to room temperature. The dimensions and the unit weight of the CSMB units were measured in order to calculate the dry density of the units.

Wet compressive strength

CSMB units were tested for wet compressive strength as per the procedures given in IS 3495 (Part-1):1992 [29]. The units were kept in the water for 48 hours, later it is removed from the water and the surface of the units is wiped with dry cloth in order to achieve saturated surface dry condition. The load on the CSMB specimens were applied at a rate of 2.9 kN/sec.

Water absorption test

The water absorption test was carried out as per IS 3495 (Part-2): 1992 [30]. The CSMB units were kept in the oven at a temperature of 100 ± 5ºC and the corresponding dry weight were recorded. After that the units were immersed in water for 24 hours and then the weight was recorded. The amount of increase in weight of the units is expressed in percentage.

Rate of moisture absorption

After keeping the specimens in an oven at 100 ± 5ºC, the dry weight was recorded. Then the units were soaked in the water and the corresponding weight were taken at an interval of 15, 30, 60, 120, 1440 and 2880 min. The rate of moisture absorption is calculated and expressed as percentage increase in weight with respect to their dry weight.

7) Correction for friction effects

This confinement of specimens by platen restraint increases the apparent strength of the material. Hence the compressive strength that are obtained during the test are largely influenced by the dimensions of the units. In the literature several correction factors are proposed to arrive at representative uniaxial compressive strength. In this study the correction factors proposed by Krefeld [31] for fired clay bricks and Heathcote and Jankulovski [32] for SSB are used. These correction factors are based on aspect ratio and it is listed in Table IV

TABLE IV CORRECTION FACTORS (CF) FOR END CONFINEMENT [33]

Correction factor	Aspect ratio				
	0.4	0.7	1	3	≥ 5.0
Krefeld's (Fired clay bricks)	0.5	0.6	0.7	0.85	1
Heathcote & Jankulovski (SSB)	0.25	0.4	0.58	0.9	1

8) Testing CSMB units to assess size effect

CSMB units of size 290x190x90 mm was prepared with BP and FRCA at 70% and 30% constituent levels with 8% of cement. Except for the size, all other parameters are kept exactly similar to 190x90x90 mm units. To study the influence of size, compressive strength was determined on the cubes 70 mm and 90 mm cut from the CSMB units 290x190 x90 mm, as well as, on the units also.

Results and discussions

Cube test results

9) OMC of the mixes

Test results of cube specimens with moisture content varying from 13 % to 19% for each of the three mix variants are given in Table V. It is observed that, 16 % water content yields minimum porosity and

maximum bulk density for all the three percentages of cement contents used in this study

TABLE V. Optimum Moisture Content of the mixes

Cement (%)	BP (%)	FRCA (%)	Water Content (%)	Compacted Density (kg/m³)	Water Absorption (%)	Void Ratio	Porosity
6	70	30	13	1791	22.15	0.63	0.387
			14	1876	15.15	0.372	0.271
			15	1876	17.73	0.45	0.31
			16	**1961**	**14.12**	**0.337**	**0.252**
			17	1904	15.58	0.377	0.274
			18	1933	14.35	0.342	0.255
8	70	30	13	1848	18.21	0.443	0.307
			14	1990	16.12	0.386	0.279
			15	2047	16.04	0.386	0.279
			16	**2103**	**14.65**	**0.354**	**0.262**
			17	2075	15	0.359	0.264
			18	2047	15.35	0.37	0.27
			19	2075	15.09	0.365	0.267
10	70	30	13	1819	20.14	0.473	0.321
			14	1933	16.26	0.397	0.284
			15	1990	16.23	0.392	0.281
			16	**2103**	**13.56**	**0.334**	**0.25**
			17	2018	15.85	0.381	0.276
			18	2103	13.6	0.334	0.25
			19	2047	15.15	0.359	0.264

10) Wet density and 28 days compressive strength of cube specimens

The test results pertaining to wet density and 28 days wet compressive strength are given in Table VI.

11) Statistical analysis of cube test results

The statistical analysis of test results is listed in Table VII. The statistical parameters are normalized with respect to mix 6C.

TABLE VI. Wet density and 28 days wet compressive strength

Mix	6C	8C	10C
Wet density (kg/m³)	1989	1989	1989
	2003	1961	1989
	2003	1989	1989
	1932	1932	1989
	1961	1989	1961
	1947	1989	1989
Wet comp. strength (MPa)	3.43	6.68	7.26
	3.43	6.1	6.78
	3.23	5.9	7.14
	3.49	5.72	6.8
	3.57	6.38	7.2
	4.03	6.4	6.12

TABLE VII. Statistical analysis of cube test results

Mix	Wet density (kg/m³)				Wet compressive strength (MPa)			
	μ	σ	Min	Max	μ	σ	Min	Max
6C	1973	30.18	1932	2003	3.53	0.27	3.23	4.03

| 8C | 1975 | 23.79 | 1932 | 1989 | 6.2 | 0.36 | 5.72 | 6.68 |
| 10 C | 1984 | 11.43 | 1961 | 1989 | 6.88 | 0.43 | 6.12 | 7.26 |

12) Inference

The compressive strength is found to increase by 1.75 times, as the cement content is increased from 6% to 8%. However, with increase of cement content from 8% to 10% only a negligible increase in the strength is observed

Test results of CSMB units

13) Density and wet compressive strength

The density and wet compressive strength of CSMB units are listed in Table VIII.

TABLE VIII. DENSITY AND WET COMPRESSIVE STRENGTH OF CSMB UNITS AT 28 DAYS

Mix	6C		8C		10C	
	Dry	Wet	Dry	Wet	Dry	Wet
Density kg/m³	175	201	183	205	185	206
	1816	2040	1875	2057	1777	2034
	1761	2018	1826	2050	1839	2034
	1819	2057	1842	2037	1875	2076
	1836	2076	1849	2076	1868	2014
	1806	2060	1842	2053	1836	2040
Wet compressive strength (MPa)	4.58		5.46		9.31	
	5.36		7.61		7.05	
	4.5		5.94		9.96	
	4.7		6.16		6.3	
	4.9		6.39		6.51	
	5.23		6.36		9.54	

14) Statistical analysis of test results

The statistical analysis of the test results reported in Table 8 is listed in Table IX. It is noted that the representative value of average compressive strength in wet conditions, is more than 1.4, 1.8 and 2.3 times of the minimum requirement for the mix comprising 6 %, 8% and 10% of the cement content. The ratio of average wet and dry density is found to be in the range of 1.11 to 1.14.

TABLE IX. DESCRIPTIVE STATISTICS OF DENSITY AND WET COMPRESSIVE STRENGTH OF CSMB UNITS

Parameters	6C			8C			10C		
	Density (kg/m³)		f_{wet} (MPa)	Density (kg/m³)		f_{wet} (MPa)	Density (kg/m³)		f_{wet} (MPa)
	Dry	Wet		Dry	Wet		Dry	Wet	
μ	1799	2044	4.88	1844	2055	6.32	1841	2044	8.11
Min	1755	2014	4.5	1826	2037	5.46	1777	2014	6.3
Max	1836	2076	5.36	1875	2076	7.61	1875	2076	9.96

15) Correction due to end effects

The geometric correction factor based on aspect ratio is equal to unity can be assumed as 0.7 and 0.58 as per, Krefeld [33] and Heathkote [34] respectively. The corrected compressive strength of CSMB units are listed in Table X. With the correction factor of 0.7 or 0.58, the mix with 8 and 10% cement content meet the minimum strength requirement of 3.5MPa. CSMB units with cement content as 6%, fails to satisfy the minimum strength requirement of 3.5 MPa.

TABLE X. CORRECTION DUE TO END EFFECTS

Size of CSMB	Aspect ratio	Compressive strength	Mix composition		
			6C	8C	10C
190x90x90	1	Test Result	4.9	6.32	8.1
		Corrected value with CF = 0.7	3.4	4.42	5.7
		Corrected value with CF = 0.58	2.8	3.67	4.7

16) Water absorption

The water absorption test results of six units of each of the three mix compositions are listed in Table XI, along with their statistics. It is observed that this important property is also in compliance with the maximum absorption limit of 18% as per IS 1725:2013[28].

TABLE XI. WATER ABSORPTION (%) AFTER 24 H.

Sl.no	6C	8C	10C
1	15.7	12.2	10.5
2	13.5	9.7	10.4
3	15	12.3	10.5
4	14	10.6	10.8
5	14.2	12.3	10.5
6	14.5	11.5	11.7
Statistical measures			
μ	14.8	11.3	10.7
σ	0.78	1.08	0.5

17) Rate of moisture absorption

The test results of rate of moisture absorption of six CSMB specimens of all the three mix compositions are given in Table XII. The plot of the variation of the rate of absorption with time is found to follow an exponential trend as shown in Fig.2. Nearly 50% of absorption takes place in the first 30 min of soaking for 8% and 10% of cement content. At 120 minutes of immersion time, the absorption is found to be at 91.3%, 89% and 78% of absorption at 2880min, for the mix 6C, 8C, and 10C respectively.

TABLE XII. RATE OF MOISTURE ABSORPTION

Cement (%)	Moisture absorption in %					
	15min	*30 min*	*60 min*	*120min*	*1440 min*	*2880 min*
6	11	12.9	14.4	14.9	15.7	15.9
	10	11	12	12.9	13.5	14.5
	10.9	12.	14	14.3	15	15.5
	10.6	11	12.	13	14	14.4
	11	12.	13	13.5	14.2	14.5
	10.7	12	13.	13.7	14.5	15
8	6.2	8.2	9.9	11.4	12.2	12.4
	5.6	6.9	8	8.8	9.7	9.9
	5.7	7.3	8.9	10.7	12.3	12.5
	4.6	6.4	7.8	9.4	10.6	10.9
	6.2	8.1	9.7	11.3	12.3	12.3
	6.2	7.4	9	10.4	11.5	11.6
10	4.5	5.3	6.7	8.6	10.5	11.6
	4.9	5.8	7	9	10.4	11.3
	4.7	5.5	6.8	8.8	10.5	11.4
	4.6	5.7	7.3	9	10.8	11
	4.7	5.6	7	8.9	10.5	11.3
	5.1	6.6	8.1	9.9	11.7	11.9
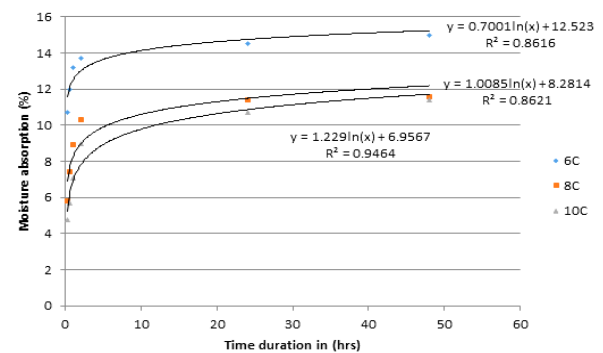
Fig. 2. Plot of average absorption versus time

18) Size effect on wet compressive strength of CSMB units

Test results are listed in Table XIII, along with the pertinent results listed in Table VI with respect to 70.6 mm cubes and Table VIII with respect to CSMB units 190 x 90 x 90 mm cast from similar mix composition.

TABLE XIII. WET COMPRESSIVE STRENGTH OF CAST AND CUT CUBE SPECIMENS AND 190x90x90 MM AND 290 x 190 x 90 MM CSMB UNITS

Sl.no	70.6 mm cube specimens cast (Table VI)	70 mm cube specimens cut from 290 x190 x90 mm	90 mm cube specimens cut from 290 x190 x 90 mm	190 x90 x 90 mm block cast (Table	290 x190 x90 mm block cast

				VIII)	
1	6.68	4	4.29	5.46	12.0
2	6.1	4.8	3.68	7.61	11.1
3	5.9	3.72	4.07	5.94	10.5
4	5.72	4.9	3.45	6.16	9.14
5	6.38	3.83	4.05	6.30	10.0
6	6.4	4.18	4.48	6.36	11.8
Average	6.2	4.2	4	6.3	10.8
Mini	5.7	3.7	3.5	5.5	9.1
Max	6.7	4.9	4.5	7.6	12.1

Following observations are made:

1. The 70 mm and 90 mm cube samples cut from CSMB units show a decrease of 32% and 35% in wet compressive strength when compared with 70.6 mm cube samples cast from the same mix. The reduction is thought to be due to the possibility of lack of uniformity with respect to mix composition as well as the compaction owing to the large size of the units.

2. The 90 mm cube samples cut from CSMB units show a 5% reduction in wet compressive strength when compared with 70 mm cube samples cut from the same units, in spite of the aspect ratio being unity in both the cases. This reduction of strength in 90 mm cube specimens may be attributed to the decrease in the zone of confinement with the increase in specimen size and tending towards unconfined uniaxial compressive strength.

3. It is interesting to note that the average strength attained by 190x90x90 mm units is almost the same as the strength attained by 70.6 mm cubes cast from the same mix composition. In both the cases, the aspect ratio is unity. Typically, the strength attained by 190 x90x90 mm units should have been slightly lesser than the strength attained by the 70.6 mm cube specimens due to the increase in specimen size. This may be due to the presence of frictional forces over large contact area (190mmx90mm) available with the CSMB units.

4. The 28 days wet compressive strength of CSMB units 290 x190 x90 mm with aspect ratio as 0.47 is about 70% more than the strength attained with units 190 x90x90 mm with aspect ratio as 1.0. This observation is in conformity with the observation that the apparent uniaxial strength increases with a decrease in aspect ratio. However, the cube specimens cut from the units show a reduction in strength of about 37% when compared with the strength attained by 190 x90x90 mm units.

5. The correction factor for CSMB units 290 x190 x90 mm works out to (1/1.71 = 0.58) to get the strength of CSMB units 190x90x90 mm. The results signify the influence of units size on compressive strength.

6. Assuming the cube specimens cut from the blocks to represent the intrinsic strength, the correction factor for 190x90x90 mm units works out to 0.63 and for 290x190x90 mm units as 0.37, which are in between the values proposed by Krefeld [33] for fired clay bricks and K. Heathcote and E Jankulovski [34] for SSB as listed in Table 4.

7. The aforementioned observations are based on the limited test data generated during the course of this study. To validate these observations, a large number of self-similar specimens have to be tested.

Conclusions

i. CSMB - 190 x 90 x 90 mm units with 8 and 10% of cement content have the potential to attain strengths in excess of the minimum strength = 3.5MPa.

ii. The procedure envisaged in this study to make CSMB units has ensured that the minimum required a dry density of 1750 kg/m³ can be achieved.

iii. The percentages of water absorption of CSMB units are found to be higher, but are, still within the permissible limit of 18%. The

higher water absorption is thought to be due to the porous nature of FRCA.

iv. The plot of the variation of the rate of moisture absorption with time is found to follow an exponential trend. Nearly 50% of absorption is found to take place in the first 30 min of soaking for 8 % and 10% of cement content.

v. The 70 mm and 90 mm cube samples cut from CSMB units show a decrease of 32% and 35% in wet compressive strength when compared with 70.6 mm cube samples cast from the same mix.

vi. The 28 days wet compressive strength of CSMB units 290 x190 x90 mm with aspect ratio as 0.47 is about 70% more than the strength attained with units 190 x90x90 mm with aspect ratio as 1.0. This observation is in conformity with the observation that the apparent uniaxial strength increases with a decrease in aspect ratio.

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Experimental Investigation on Leachate-Contaminated Lateratic Soil

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ABSTRACT

Contamination of soil due to the Leachate from Municipal Solid waste is a major environmental problem. Landfill leachate is generated from liquids existing in the waste as it enters a landfill or from rainwater that passes through the waste within the facility. A large quantity of Leachate is produced from the dump yards in various parts of India. With urban development and expansion, these areas are reclaimed for construction and other purposes. The engineering behaviour of structures constructed of/with municipal solid waste fills are unpredictable. An extensive laboratory exploration was carried out to determine the index properties, shear strength characteristics, compaction characteristics and hydraulic conductivity of clean and contaminated lateritic soil. Contaminated samples are prepared by mixing the lateritic soil with varying amount of leachate content like 20%, 40%, 60%, 80% and 100% by weight to vary the degree of contamination. The effects of leachate on the Atterberg's limit showed decrease in liquid and plastic limit values with the increase in the leachate content. Reduction in maximum dry density and increase in hydraulic conductivity were observed.

Keywords : Leachate, Residual Soil, Atterberg's Limit, Shear Strength.

I. INTRODUCTION

A landfill is an engineered pit, in which layers of solid waste are filled, compacted and covered for final disposal. It is the "simplest, cheapest and most cost effective method of disposing waste" in several parts of the world. Despite these benefits, leachate is a threat to the environment due to the presence of toxic inorganic and organic constituents in the leachate. Leachate is produced in landfill sites through hydrolysis processes (products of biochemical changes in organic substances) or is the result of water penetration. It is composed of large amounts of both organic and inorganic compounds, and their concentration depends to the age of a landfill site. Leachate from an improperly constructed landfill results an extensive contamination of soil beneath and adjacent to the dumping area. Leachate from the solid waste dump has a significant effect on the chemical properties as well as the geotechnical properties of the soil. Leachate can modify the soil properties and significantly alter the behaviour of soil. Laterite soil is one of the important soil groups of Kerala. Large areas of land with lateritic soil are currently used for open dumping of municipal solid waste. This paper presents the results of a laboratory testing program carried out to determine the effect of leachate contamination for a period of 15 days on the geotechnical characteristics (consistency limits, compaction characteristics, hydraulic conductivity and shear strength) of lateritic soils.

Experimental Investigation

Study Area

The study area is located in Brahmapuram, a small village in Kochi, Kerala, India which spans across 106 acres. The volume of waste being dumped at the dump yard was 250 tonnes/day. Various waste materials such as domestic waste, e.g. Kitchen waste; plastic, paper, glass, cardboard, cloths etc. are dumped at this site. Construction and demolition waste like bricks, blocks, timber, are also dumped. Poultry market, fish market, slaughterhouse, dairy farm and non-infectious hospital waste is also dumped. The site is a Non-engineered low lying open dump, a huge heap of waste up to a height of 20 m. The main problem here is the contamination in the surface water bodies and the soil.

Soil samples were collected by removing the surface debris and subsurface soil dug to a depth of about 30cm and 1m with a hand auger.

50 Kg of soil sample was taken for analyzing soil chemical properties, soil consistency limits such as liquid limit, plastic limit, shrinkage limit, plasticity index, specific gravity, compaction characteristics, hydraulic conductivity and shear strength of soil in the laboratory. The geotechnical properties of the soil are given in Table I.

TABLE I . GEOTECHNICAL PROPERTIES OF THE SAMPLE SOIL.

Properties	values
Specific Gravity	2.62
Liquid Limit,%	35
Plastic Limit,%	21
Maximum dry density (g/cc)	2.25
Optimum Moisture Content (%)	12.5
Permeability(k)	2.7×10^{-5}
Gravel (%)	2
Sand (%)	62

Silt (%)	22
Clay (%)	12

The chemical characteristics of the laterite soil was examined and the results obtained are shown in Table II.

TABLE II . CHEMICAL CHARACTERISTICS OF THE SAMPLE SOIL.

Properties	values
pH	4.5
$CaCO_3$ (%)	2.75
OM of soil (%)	0.58
$SO_4 \times 10^{-3}$ (%)	4
Fe_2O_3 (%)	8.2
SiO_2 (%)	72
Al_2O_3 (%)	45

$CaCO_3$ - Calcium carbonate; OM - Organic matter; SO_4 - Soluble sulphate; Fe_2O_3 - Iron content; SiO_2 - Silica; Al_2O_3 - Alumina content

Leachate

Leachate used in this study was collected from Brahmapuram Biogas Plant, Ernakulum, Kerala. The characteristics of leachate are given in the Table III. The alkalinity, pH value and the cation content are very significant parameters that affect the properties of the soil.

TABLE III . COMPOSITION OF THE LEACHATE

Parameter	Maximum concentration in (mg/L)
COD	285
Total Dissolved solids	2359
Total hardness	170
pH	6.1
sulphate	Trace
chloride	2136
calcium	50

sodium	250
potassium	420

Chemical analysis was carried out based on the standard methods published by American Public Health Association.

Test Programme

Laboratory tests were conducted to determine the index properties, compaction characteristics and hydraulic conductivity of clean and contaminated lateritic soil. Contaminated samples are prepared by mixing the lateritic soil with varying amount of leachate content like 20%, 40%, 60%, 80% and 100% by weight to vary the degree of contamination. The samples were tested after a curing period of 15 days. The test samples were preserved in air tight packets to ensure proper reaction between the soil and leachate.

Results and Discussions

Effect of Leachate on Atterberg's limits

The Atterberg's limit is used to identify the soil water content that is related to the behavior of the soil. The liquid limit, wL of leachate mixed soil indicated the decreasing in value from 35 % to 18 % with the increase of leachate contents between 0% and 100%. The differences in the decrease in liquid limit value were higher than the plastic limit.

Lateritic soil contains more of kaolinite mineral having low shrink–swell capacity and a low cation exchange capacity. Unlike, montmorillonite mineral, the effect of diffused double layer is negligible in kaolinite.

However, the Liquid limit behavior which depends on the diffused layer was found to decrease in laterite soil, even though the presence of kaolinite mineral was more. As the amount of leachate increases, the water content will reduce and the chance to react with soil particles will eventually drop. The leachate is more acidic in nature which results in reduction of liquid limit due to increase in concentration of electrolyte of the pore fluid and therefore, decreases the thickness of diffused double layer.

The variation of liquid limit with different percentages of leachate in shown in Fig 1.
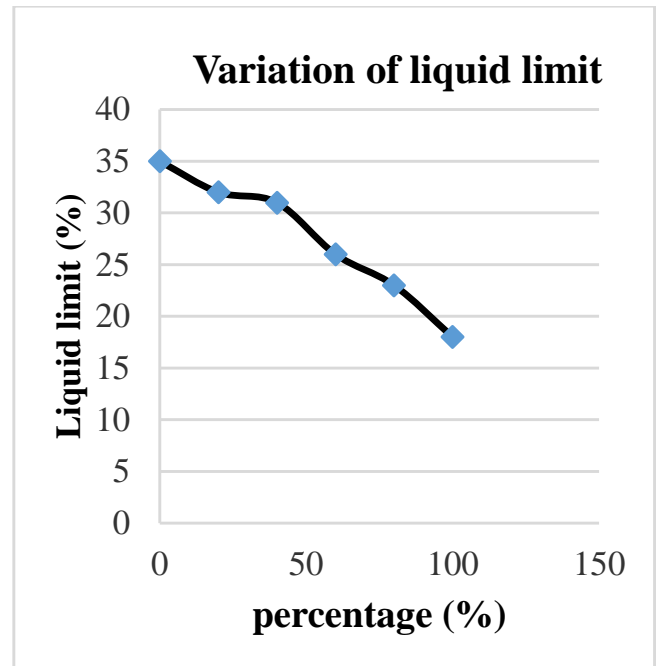
Fig 1. Variation of Liquid limit

Effect of Leachate on Compaction characteristics of soil

The soil sample was mixed with the leachate and allowed for curing for about 15 days and the Standard Proctor compaction tests were carried. The results are plotted in Fig.2, in the form of dry density versus water content curves.

The maximum dry density of the laterite soil decreases with increasing concentration of leachate and optimum moisture content increases with increasing concentration of leachate. This is mainly due to the chemical reaction between the minerals present in the soil and the compounds present in the leachate.

The presence of chemicals in leachate, changes the structure of pore fluid in soil, thereby affecting the properties of soil. Maximum reaction occurred at a

leachate concentration of 60%, beyond which the soil properties were not affected.
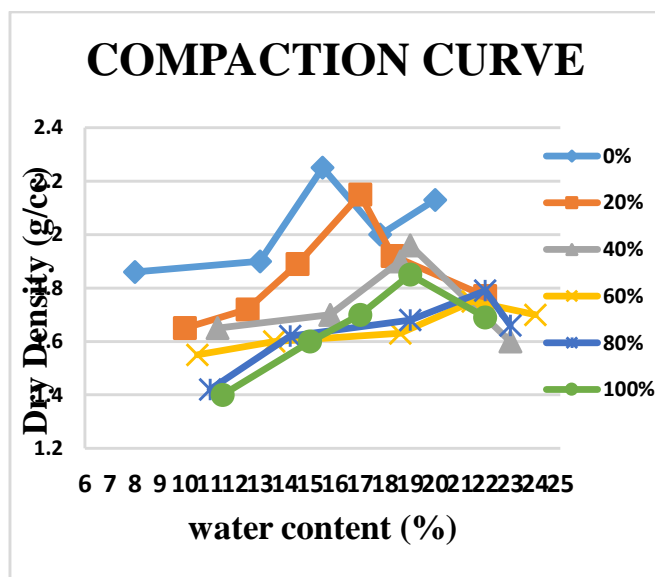
Fig 2. Variation of Comapction characteristics

Effect of Leachate on Hydraulic Conductivity of soil

Falling head permeability tests were conducted on samples cured with varying concentration of leachate for 15 days. The hydraulic conductivity was found to increase with increase in leachate content (Fig. 3). This increase in hydraulic conductivity of the soil was due to chemical reaction between the leachate and the clay minerals present in lateritic soil. The acidic leachate can dissolve clay minerals increasing the pore space in soil and hence the hydraulic conductivity increases.
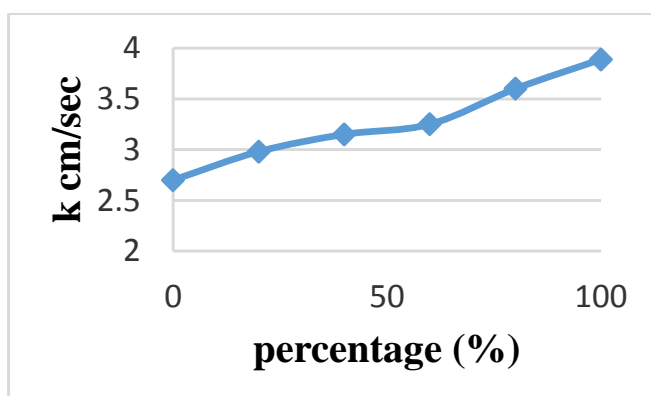
Fig 3. Effect of Chemicals on Permeability in 10^{-5} cm/s

Effect of Leachate on Shear Strength of soil

Soil samples compacted at Maximum dry density and Optimum moisture content were used to find the shear parameters of soil samples mixed with leachate. Consolidated Undrained triaxial test was conducted on samples after saturated and prior application of back pressure. The results are shown in Table IV.

The cohesion of soil was found to increase slightly and the internal friction decreased. The leachate has increased the bonding between the particles by altering the chemical composition such that the soil behaved more like a clay having more of cohesion and less of shearing resistance.

TABLE III . SHEAR STRENGTH OF LATERITIC SOIL MIXED WITH LEACHATE

Sample	Cohesion (c') kN/m²	Angle of internal friction (φ')
Soil	18.2	31
Soil + 20% Leachate	20	26
Soil + 40% Leachate	24.6	22
Soil + 60% Leachate	27.3	16
Soil + 80% Leachate	27.8	15
Soil + 100% Leachate	28.5	13

Conclusion

The experimental investigations gave an insight to the effect of leachate on the geotechnical properties of laterite soil. The liquid limit and plasticity index decrease with an increase in the percentage of leachate. This decrease in the Atterberg's limits are due to the predominant influence of the increased electrolyte concentration and organic chemicals present in the leachate on the

diffuse double layer thickness of soil. Leachate contamination leads to increase the hydraulic conductivity of the soil tested. This is attributed due to the chemical reactions with the leachate and the soil particles. Highly acidic or basic leachate can have significant effect on the index and engineering properties of the soil. Experimental results indicated that with the increase in percentage of leachate, maximum dry density decreased from an initial value of 2.25g/cm³ to 1.75 g/cm³ and optimum moisture content increased to 22% from an initial value of 12.5 % when the soil was mixed with 60% leachate by weight. Beyond which no significant change was observed. The cohesion of the laterite soil increased and the shearing resistance decreased with increase in Leachate concentration. This variation is attributed to the chemical reaction between the soil and the leachate, resulting in soil to behave more like clay.

Based on this study, the presence of leachate fluid in the soil brings negatives impact to the geotechnical properties of Lateritic-clayey soil. Soil-leachate contamination must be recovered before any construction is done.

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Experimental Study on Lime Stone Powder as a Binding Material in Concrete Mix

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ABSTRACT

Extensive research is in progress in the field of concrete technology in finding suitable replacement for cement. With the rapid growth in construction industry leading to increased consumption of concrete which further leads to increase in production of cement, resulting in global sustainability problems. An attempt has been made to study the effects on properties of both fresh and hardened concrete by using lime stone powder as an alternative binding material to cement at various percentages (5%, 10% and 15%).

Keywords : Lime Stone Powder, Slump, Compressive Strength

I. INTRODUCTION

With the revolution in construction industry, the demand for cement concrete has increased tremendously over a period of certain years. Extensive research has been under progress in the field of cement concrete to find suitable alternative materials in the place of conventional materials which is essential for global sustainability. cement has the largest footprints when it comes to both carbon dioxide release and energy consumption. Lime stone powder, is one of such material which possess cementitious properties and can be used as partial replacement for cement with the improved properties of concrete such as workability, bleeding control etc. Use of limestone also results in improved density of concrete.

Even though an increase in early strength was observed, loss of strength at later ages due to incorporation of limestone has also been reported.

Literature Review

Wendimu Gudissa etal. (2010) The investigation has revealed that, Replacement of ordinary Portland cement by fine limestone powder from 5% to 10% with Blain fineness value of 4000 to 4500 cm^2/gm satisfies the standard compressive strength requirement of high early strength cement as per the standard requirements. The results of grinding shows that, as the replacement of limestone increases by weight, increases in cement fineness and decrease in grinding time were observed compared to pure ordinary Portland cement. Since limestone is softer to grind than pure clinkers the energy required is also relatively less than required to grind pure clinker for Portland cement production. The test results indicated that, the compressive and flexural strengths of cement mortar decrease with the increase in the percentage addition of limestone content for same blain fineness and also increase with the increase of fineness

Didier Lootens et.al

Have concluded that, use of lime stone powder and silica lead to acceleration in hydration of cement and cement can be replaced by these filler up to 40%, with minimum impact on initial setting times and are helpful in applications where controlled setting is more important than development of high strengths. Also it is reported that, the rate of hydration with the use of lime stone is more than that of silica. Also improvement in rheological properties was observed due to reduction in yield stress and consistency factors.

Tarun R. Naik etal. This study gives the information about increase of effective w/c, accelerate early-age strength, dilution of cement paste and cement concrete mix effects the rate of hydration by using the limestone powder filler in cement. The addition of limestone powder filler to fine cement pastes and mortars reduces the diffusion coefficient of chloride ions. Using limestone powder in concrete proves economic and environmental advantages by reducing the usage of Portland cement in constructions and CO2 emission, as well as improving the early and the later age compressive strength. Limestone powder to cement changes the phase composition of pastes in comparison with pastes without addition. They also showed limestone powder prevents the transformation of ettringite to sulphoaluminates (monosulphate, hemisulphate and solid solutions), instead of which carboaluminate phases more resistant to sulphate attack (monocarbonate, hemicarbonate) are formed.

Materials and Methodology

The physical properties of materials per performed as per IS standards. The mix design is performed as per IS 10262-2009. Then the cubes and cylinders are casted by varying the percentage of lime stone powder as a binding material in concrete mix varies from 0, 5, 10 & 15%. Tests performed on fresh and hardened concrete. The specimens were weighed after curing of 7, 14 & 28 days to know the significance changes in density before testing compressive strength.concrete mix varies from 0, 5, 10 & 15%. Tests performed on fresh and hardened concrete. The specimens were weighed after curing of 7, 14 & 28 days to know the significance changes in density before testing compressive strength.

Table.1 Chemical Composition of lime stone powder

Component	Lime stone powder (%)
Sio_2	11.25
Al_2O_3	2.76
Fe_2O_3	1.15
CaO	43.77
SO_3	0.27
MgO	2.15
Na_2O	0.35

Table.2 Physical Properties of materials

SI no.	Material	Results
1.	Specific Gravity	3.15
2.	Compressive strength(N/mm^2)	54
3.	Specific gravity of fine aggregate	2.53
4.	Water absorption of Coarse agregate	0.5%
5.	Specific Gravity of Coarse aggregate	2.72
6	Specific Gravity of Lime stone Powder	2.48

Table.3 Slump value for different mix with water cement ratio of 0.4

Sl No.	% of limestone powder added	Slump(mm)
1.	0	110
2.	5	60
3.	10	50
4.	15	45

Figure.1 Slump value for different % of limestone powder
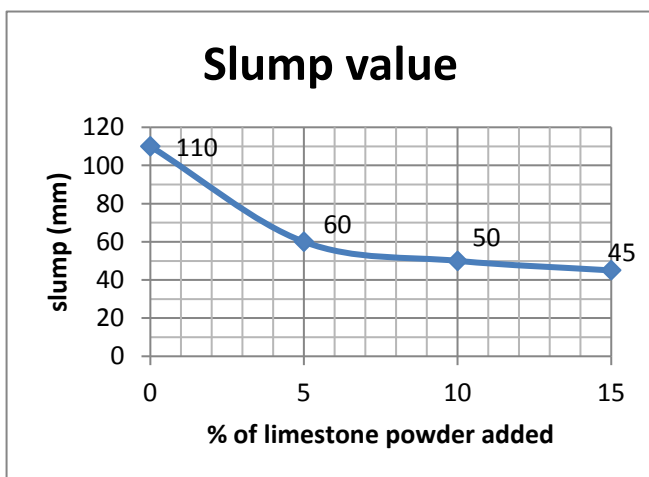
Tale.4 Density of concrete

% of limestone powder added	Density (kg/m^3)
0	2506.6
5	2488.8
10	2471.1
15	2444.4

Figure.2 Density of concrete mix v/s Percentage of limestone powder
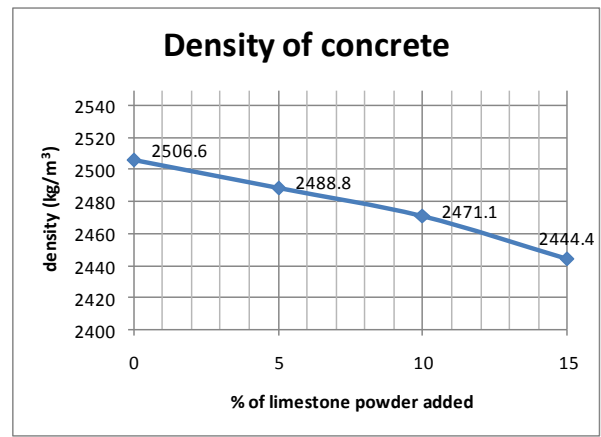
Table.5 Compressive strength

SL No.	% of limestone powder	Average compressive strength (Mpa)		
		7 days	14 days	28 days
1.	0	45.23	53.01	62.96
2.	5	46.6	50.7	60.8
3.	10	42.77	48.63	55.31
4.	15	31.2	35.4	39.5

Figure.3 Compressive strength v/s Percentage of limestone powder
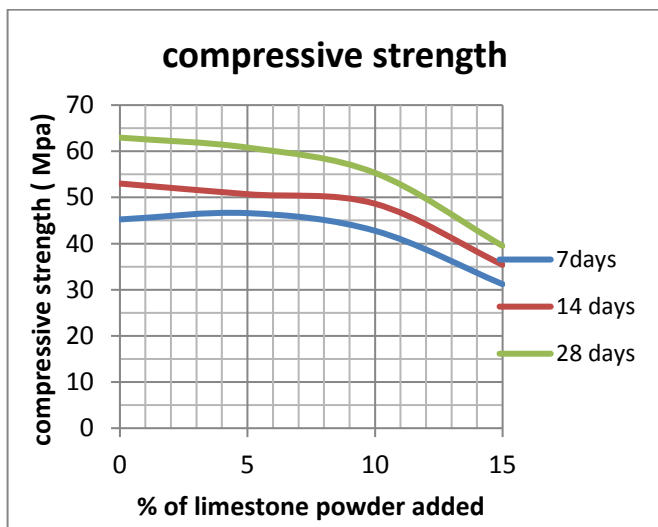
Table. 6 Tensile Strength

SL No.	% of limestone powder added	Tensile Strength(Mpa)	
		7days	28 days
1.	0	3.182	5.14
2.	10	2.9	5.04
3.	15	2.74	4.14

Figure. 4 Split Tensile v/s Percentage of limestone powder
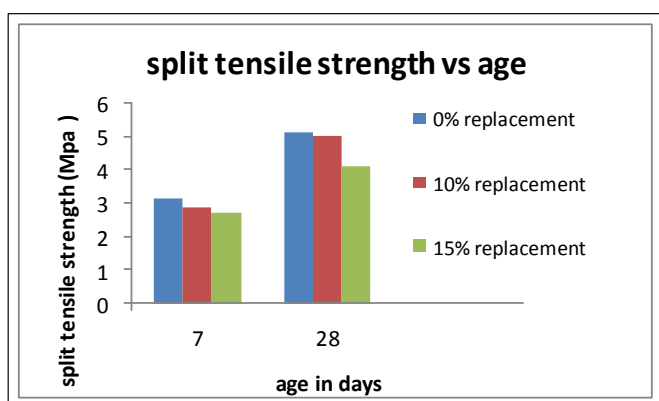
IV. CONCLUSION

The following conclusions can be drawn from the obtained experimental data:

Maximum 10% of cement can be replaced by limestone powder without change in the strength of the concrete. Required split tensile strength can be achieved by 10% replacement of cement by limestone powder. The addition of limestone filler in to Portland cement results in increase in cement fineness and this fineness of the cement provide higher rate of hydration and hence faster development of the early strength. The use of limestone powder in cement and concrete provides economic and environmental advantages by reducing Portland cement production and CO_2 emission. From the standard consistency results, it seems that limestone has no effect on water requirement compared to Portland cement. Moreover, the increase in level of fine particles caused requires much water.

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Experimental Studies on Utilization of Brick Waste as Coarse Aggregate in Concrete Mixes

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ABSTRACT

Crushed bricks as aggregates are of particular interest because their use can considerably reduce the problem of waste storage and simultaneously helps the preservation of natural aggregate resources. With this perspective, an experimental study is carried out to assess the possibility of using brick masonry waste as a partial replacement for natural coarse aggregate (NCA) in concrete mixes. Brick bats or brick masonry waste are crushed using hammer to recover coarse recycled brick aggregate (CRBA). M40 grade concrete mix is designed as per IS 10262:2009, by considering the properties of natural aggregates. NCA is partially replaced by CRBA at 10%, 20%, 30% and 40% in concrete mixes. Totally five concrete mixes (including control mix made of NCA and NFA) are considered in the study. The workability of the concrete mixes decreases with an increase in CRBA content. A marginal reduction in 28 days compressive strength is observed up to 20% replacement of NCA by CRBA. At 30% and 40% replacement level, the reduction in compressive strength is about 15% and 30% respectively. The tensile strength decreases with increase in CRBA content in concrete mix.

Keywords : Coarse recycled brick aggregate (CRBA), Control Mix, Natural coarse aggregate (NCA), Natural fine aggregates (NFA).

I. INTRODUCTION

In India, a large quantity of construction and demolition waste is generated every year. These waste materials need a large place to dump and hence the disposal of waste has become a severe issue in urban seector. On the other hand scarcity of natural resources is another major problem that results in changes in climatic conditions. Hence it becomes necessary to protect and preserve natural resources.

As per the Technology Information, Forecasting and Assessment Council (TIFAC) the construction industry contributes waste is between 12 to 14.7 million tons per annum. The waste that is generated from Construction Industry in India is estimated and given in Table I.

TABLE I CONSTITUENT OF CONSTRUCTION AND DEMOLITION WASTE IN INDIA

Constituent	Quantity Generated in million Tons p.a. (Range)
Soil, Sand & gravel	4.20 to 5.14
Bricks & Masonry	3.60 to 4.40
Concrete	2.40 to 3.67
Metals	0.60 to 0.73
Bitumen	0.25 to 0.30
Wood	0.25 to 0.30
Others	0.10 to 0.15

Demand to supply of building material is in the range of of about 60,000 million cu.m. Reuse of aggregate material from construction and demolition debris certainly mitigate to a larger extent the demand-supply gap.

While retrievable items such as bricks, wood, metal, titles are recycled, the concrete and masonry waste, accounting for more than 60% of the construction and demolition debris, are not being presently reused in India.

Construction waste is being reused in many European Countries. More than 60% of the waste has been recycled in these countries and the recycling prospect in India constitutes only about 6-8%.

Concrete and masonry waste can be reused by sorting, crushing and sieving into recycled aggregate. Such recycled aggregate can be used to produce concrete for construction and building material.

The use of recycled concrete aggregate started almost 70 years ago just after the Second World War, during which many structures were demolished by bombing. Many researchers around the world endorse the use of recycled concrete aggregates in concrete mixes that can be used for structural and non-structural applications. However, very few experimental studies are conducted on use of brick masonry waste in concrete applications.

The sustainability in construction gained importance since the construction industry consumes large quantities of natural resources and produces huge quantities of waste. Concrete being a composite material (a binder, water, and aggregates) that is widely used, there exists a large scope of them being reused.

Hypothesis and objectives of the study

Natural aggregate resources can be preserved by reusing the bricks after crushing them into size of aggregates. This also addresses the issue related to disposal of construction debris thereby decreasing environmental pollution . Certain issues related to water absorption and impurities, if addressed properly results in utilization of brick waste in concrete mixes as an alternative solution.

With this backdrop, an experimental study is carried out to assess the practicability of using brick masonry waste as a partial replacement for natural coarse and fine aggregates in concrete mixes. The objective of the study is as follows:

To study the properties of concrete mixes in its fresh and hardened state by using coarse recycled brick aggregate (CRBA) partially in place of natural coarse aggregate (NCA) by 10%, 20%, 30%, and 40%.

Literature review

Debieb and Kenai [1] attempted to determine the possibility of using crushed brick as coarse and fine aggregate in concrete mixes and opined that brick aggregates can be used up to 25% and 50% for the coarse and fine aggregates, respectively.

Cachim [2] concluded that a 15% replacement of natural coarse aggregate by brick aggregate results in same property as that of that of concrete made with natural aggregates.

Yang et al… [3], ascertained the influence of crushed clay bricks (as coarse aggregate) on properties of recycled aggregate concrete, the concrete mix with 50% of crushed clay bricks and 50% of recycled concrete aggregates yields satisfactory results in terms of durability.

Ge et al…. [4], emphasized the use of recycled clay brick powder as replacement to cement in concrete mixes partially. They also proposed an optimal mix design through experimentation and orthogonal analysis.

Aliabdo et al… [5], explored several possibilities of using crushed clay brick in the concrete industry, the experimental evidence encourages the use of brick waste in many applications where the temperature resistance, economy, and environmental aspects are considered.

Bektas et al… [6], advocated the use of 10% and 20% of crushed clay brick fine aggregate in mortar

specimens, by considering the strength and durability aspects.

Poon and Chan [7], concluded the use of 25% crushed clay brick satisfies the strength requirements for Grade B paving blocks as prescribed by ETWB of Hong Kong

Sadek [8] investigated the feasibility of using crushed brick aggregates in making solid cement bricks. He found that the parameters such as size and replacement level of the crushed bricks have a detrimental effect on the compressive strength.

Materials and Methods

Concrete mixes are prepared by using cement, NFA, NCA, and CRBA.CRBA is obtained by manual crushing of brick bats using a hammer.
Ordinary Portland cement (OPC) of 53 grade is used throughout the experimental study. aFor NCA Crushed stone is used and for NFA river sand <4.75 mm is used. The physical properties of materials are evaluated in compliance with the codes.

Properties of Ingredients

The physical properties of cement were evaluated in compliance with the IS 4031 [9–14]. The outcomes are listed in Table II. The physical properties of NCA, CRBA, NFA are evaluated in compliance with the IS: 2386 [15, 16]. The outcomes are listed in Table III.

TABLE II. PHYSICAL PROPERTIES OF CEMENT

Sl.No	Parametres	Cement
1	Specific gravity	3.08
2	Fineness (%)	3.06
3	Standard consistency (%)	31
4	Initial setting time (min)	60
5	Final setting time (min)	220
6	Compressive strength, N/mm²	56

TABLE III. PHYSICAL PROPERTIES OF AGGREGATES

Sl.No.	Parameters	Aggregates		
		NCA	CRBA	NFA
1	Specific Gravity	2.65	1.83	2.6
	Water absorption	0.25	12.9	-
2	Fineness Modulus	6.6	6.52	3.52
5	Impact test (%)	16.5	57	-
6	Crushing test (%)	28.5	60.3	-

Mix design

The mix proportion adopted is 1:2:3.3 having 0.8% of SP, and 0.45 water cement ratio. The concrete mixes were prepared using two fractions of coarse aggregates. The coarse aggregate passing 20 mm and retained on 10 mm IS sieve is used as 60% while, the remaining 40% is the fraction passing 10 mm and retained on 4.75 mm IS sieve. The natural coarse aggregate is used in SSD state and natural fine aggregate are used in ambient dry state.

Casting and curing of test specimens

In compliance with IS: 10086 [18] 150 mm size concrete cubes and conforming to IS: 5816 [19] cylinders of size 150 mm dia. and 300 mm height are prepared. The specimens are removed from moulds After 24 hours,the specimens are removed from the moulds and immersed completely in the curing tank for curing. Compressive strength is evaluated using 4 Cube specimens each at seven and twenty eight days , while the split tensile strength is found out using 3 cylinder specimens.

Tests performed on concrete mixes

The main purpose of this experimental study is to evaluate the properties of concrete mixes by partially replacing NCA by CRBA. In view of this,

experiments are performed to evaluate the fresh and hardened properties of the concrete.

Slump and compaction factor test were conducted to evaluate the fresh state of concrete. These tests were performed as per IS: 1199 [20].

The compressive strength of the concrete is tested as per the guidelines outlined in IS: 516 [21]. IS: 5816 [19] is followed for testing tensile strength of concrete.

Results and Discussions

Fresh properties

Table IV represents slump and compacting factor test results. With increase in CRBA content, the workability of the concrete decreases.

TABLE IV. SLUMP AND COMPACTION FACTORS OF CONCRETE MIXES

Brick bats as	Mix Designation	Slump in mm	CF
	CM	120	0.93
Partial replacement for NCA	10 CRBA	90	0.93
	20CRBA	70	0.92
	30 CRBA	60	0.89
	40 CRBA	50	0.87

Compressive Strength

The compressive strength of the concrete mixes with partial replacement of NCA by CRBA is listed in Table V. The compressive strength of CM at 7 and 28 days is found to be 43.0 and 55.0 MPa respectively. Fig 1 represents the variation in compressive strength with partial replacement of NCA by CRBA.

The compressive strength at 7 days for the concrete mixes CM, 10CRBA, 20 CRBA, 30 CRBA and 40 CRBA are 0.78, 0.79, 0.66, 0.61 and 0.79 times that of 28 days compressive strength of the respective mixes.

TABLE V. COMPRESSIVE STRENGTH OF CONCRETE MIXES

Mix Designation	Compressive Strength in MPa			
	7 days	Average	28 days	Average
CM	37		53.9	
	44.9	43	56.7	55
	45.1		52.9	
	44.9		56.7	
10 CRBA	43		52	
	42.4	42.6	53.6	53.9
	40.1		54	
	44.9		56.1	
20 CRBA	36		46.7	
	32.7	34	52	51
	34.5		51.8	
	32.8		53.6	
30 CRBA	30		42.1	
	25.3	29	49.9	46.9
	31		46.4	
	29.7		49	
40 CRBA	29		38.2	
	28.1	29	37.9	36.4
	28.1		36.9	
	30.7		32.7	

A marginal reduction in 28 days' compressive strength is observed up to 20% replacement of NCA by CRBA. The percentage reduction corresponds to 2% and 6% respectively. At 30% replacement level, the compressive strength is 46.9 MPa and the reduction is about 15%, as compared to CM. Nearly 30% reduction in the compressive strength is observed at 40% replacement level.
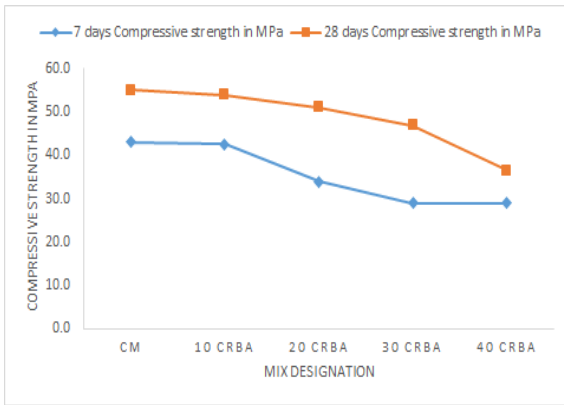
Fig. 1. Variation in compressive strength with partial replacement of NCA by CRBA

Split tensile strength

The split tensile strength of the concrete mixes with partial replacement of NCA by CRBA are given in Table VI

TABLE VI. TENSILE STRENGTH OF CONCRETE MIXES

Mix Designation	Tensile strength at 28 days	Average
CM	3.746	3.8
	3.84	
	3.88	
10 CRBA	3.82	3.7
	3.42	
	3.95	
20 CRBA	2.94	3.6
	3.9	
	3.83	
30 CRBA	3.45	3.2
	2.84	
	3.29	
40 CRBA	2.75	3.1
	3.54	
	3.05	

Conclusion

The experimental study resulted in the following conclusion:

i. The workability of the concrete mixes decreases with an increase in CRBA and FRBA content.

ii. A marginal reduction in 28 days compressive strength is observed up to 20% replacement of NCA by CRBA. The percentage reduction corresponds to 2% and 6% respectively. At 30% replacement level, the compressive strength is 46.9 MPa and the reduction is about 15%, as compared to CM. A nearly 30% reduction in the compressive strength is observed at 40% replacement level.

iii. The tensile strength decreases with increase in CRBA content in concrete mix

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Pushover Analysis of Irregular Steel Structure with Varying Irregularity Ratios

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ABSTRACT

In this paper the seismic performance of irregular steel structure with varying irregularity ratio have been investigated. For the study purpose, two different models with vertical geometric irregularity and plan irregularity according to IS 1893 (part 1) -2002 have been considered. The irregularity ratio (A/L) where A is offset and L is base width has been varied from 0.2 to 0.8. Irregular structures have been modeled using ETABS, a finite element software and plastic hinges are assigned to incorporate the inelastic seismic behaviour of structures. Performance of eleven irregular structures has been compared with regular frame structure in terms of base shear carrying capacity, roof displacement and performance point, using pushover analysis. The results indicates that as irregularity ratio increases, base shear carrying capacity and performance point of irregular structure decreases.

Keywords : Irregularity ratio; plan irregularity; pushover analysis; seismic behaviour; vertical geometric irregularity.

I. INTRODUCTION

An earthquake is a natural phenomenon which induces seis-mic wave causing ground motion, Due to this lateral forces will act on structures which in turn cause severe damage or collapse of structures. When the structure is under seismic excitations, elements in structure reaches its inelastic zone. For seismic evaluation, nonlinear behaviour of structure in inelastic zone plays significant role. Hence elastic behaviour of structure is not sufficient to analyses and design the structures [1]. During seismic excitations considering inelastic behaviour with elastic behaviour, the real behaviour of structures can be studied.

In the last decade, pushover analysis is used to study performance of structure under seismic exaction.

Pushover analysis is a sequential analysis method to study the inelastic behaviour of structures, when the structure pushed by providing monotonically increasing lateral force until a predefined target roof displacement is reached or till collapse of structure [2]. Also pushover analysis provides details regarding capacity curves and demand curves which represent ability of structure to resist the lateral loads and earthquake ground motion respectively [3]. Performance point can be obtained by superimposing capacity curves and demand curves on each other.

Irregular structures have been commonly used due to site restriction, various functional requirements and architectural demands. Researchers have shown that, irregular structure attracts more seismic forces compared to regular structures [4]. In an earlier research authors have study on the amount of

eccentricity of structures effecting the seismic behaviour. Results indicates that as eccentricity increases, torsion increases. Due to which accuracy of seismic response is reduced [5]. Authors of the researcher studied seismic response considering various irregularities type of structural configurations.

Shows than seismic response of structure varies with the irregularities type [6]. When plan irregularity and vertical irregularity structures on a sloping ground is considered, the vertical irregularity structures are more critical in seismic performance [7]. Also various researches have been carried out in order to study the seismic performance of steel frame structures. Results show that steel structures have high seismic performance [8-10]. However, limited studies have been carried out in the effect irregularity ratio on irregular steel structures for seismic evaluation. So in this study, using pushover analysis, the effect of irregularity ratio on vertical geometric irregularity and plan.

II. METHODOLOGY

A 10 story structure with height of each story 3 m is considered as regular structure. The plan of dimension 15 m × 15 m of regular structure considered in the study is given in Fig. 1. The rein-forced concrete slab considered is of 150 mm thick with M 20 grade of concrete. Eleven irregular models are considered by varying irregularity ratio. The irregularity ratio is varied by varying the offset and keeping the base width constant.

As per IS 1893 (part 1) – 2002 [11], Fig.2 shows, type (i) and type (ii) structures which are two types of vertical geometric irregularities. Fig.3 shows, type (iii) and type (iv) structures which are two types of plan irregularities. Fig. 4 to 6 shows the variation in irregularity ratio of type (i) structure. Fig. 7 and Fig. 8 shows the variation in irregularity ratio of type (ii) structure. Fig. 9 to 11 shows the variation in irregularity ratio of type (iii) structure. Fig. 12 to 14

shows the variation in irregularity ratio of type (iv) structure.
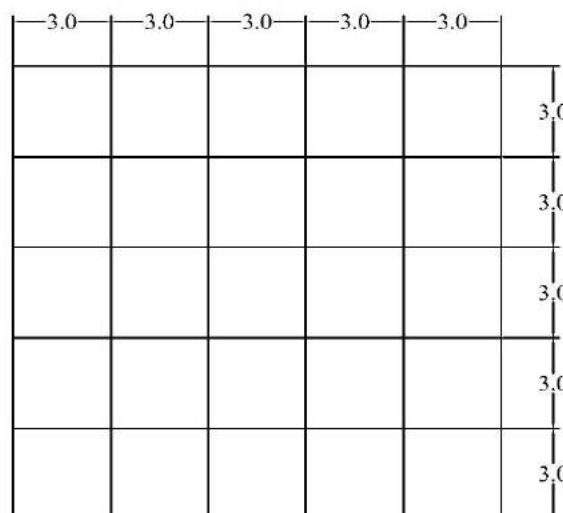
Fig. 1. Plan of the building
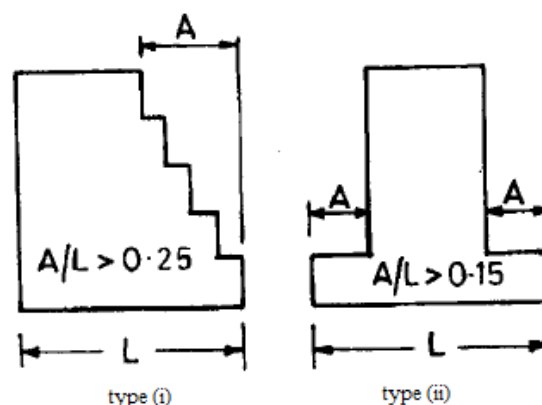
Fig. 2. Two types of vertical geometric irregularity as per IS 1893 (part 1) – 2002
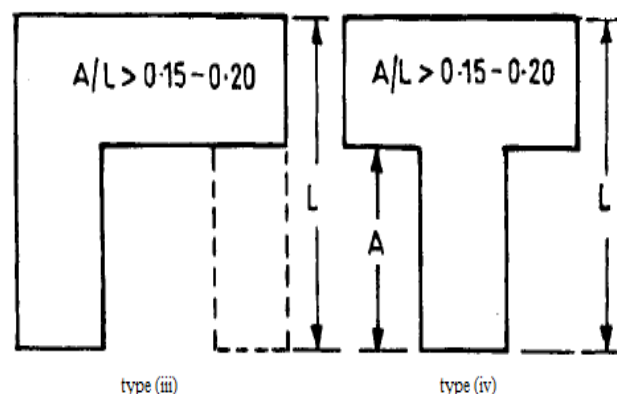
Fig. 3. Two types of plan irregularity as per IS 1893 (part 1) – 2002
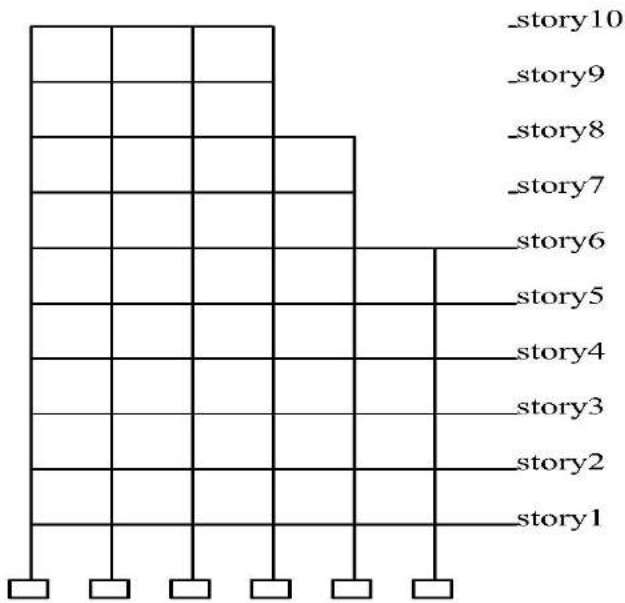
Fig. 4: Model 1, frame showing type (i) irregular structure with irregularity ratio of 0.4
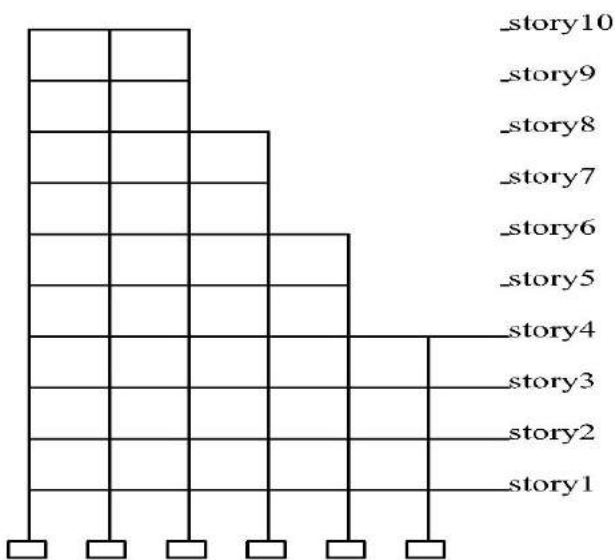
Fig. 5: Model 2, frame showing type (i) irregular structure with irregularity ratio of 0.6
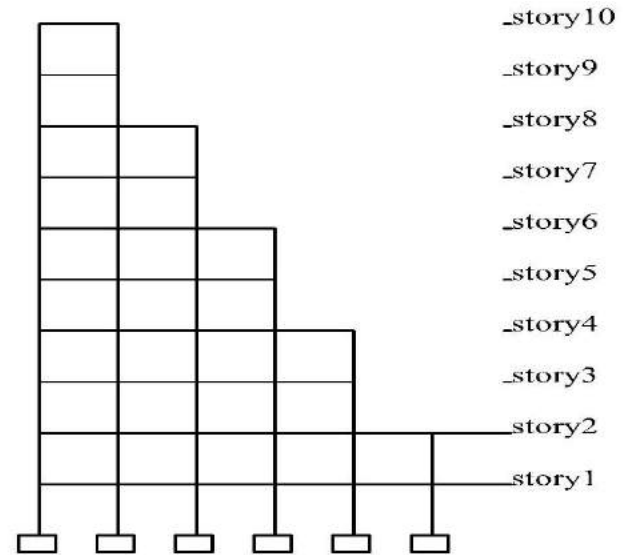
Fig. 6: Model 3, frame showing type (i) irregular structure with irregularity ratio of 0.8

The dead and live loads are considered on structure is based on IS 875 (Part I) [12] and IS 875 (Part II) [13] respectively. Live load considered on all floors is 3 kN/m² and on roof is 1.5 kN/m² with Dead load on floor is 1 kN/m² on all structural models. For seismic evaluation, structural models considered is situated in seismic zone III with response reduction factor as four. All the structural configurations are having importance factor of one with soil type medium. Using ETABS, a finite element software, beams and columns are modelled as frame elements with slab considered as membrane element. For the seismic analysis simplicity structural models are considered fixed at the base. The structural models both regular and irregular structures are designed according to IS 800 (2007) [14].

The designed steel section used for beams, columns and bracings are ISMB 200, ISWB 600-2 and ISLB 175 respectively with grade of steel used is Fe 250. The auto hinges for incorporation of inelastic behaviour of structures, M3, P-M2-M3 and P hinges are assigned to beams, columns and bracings respectively according to ASCE 41-13[15]. For seismic performance evaluation, the base shear carrying capacity, roof displacement and performance point are considered in both the

direction of applied earthquake loading i.e. X and Y direction.
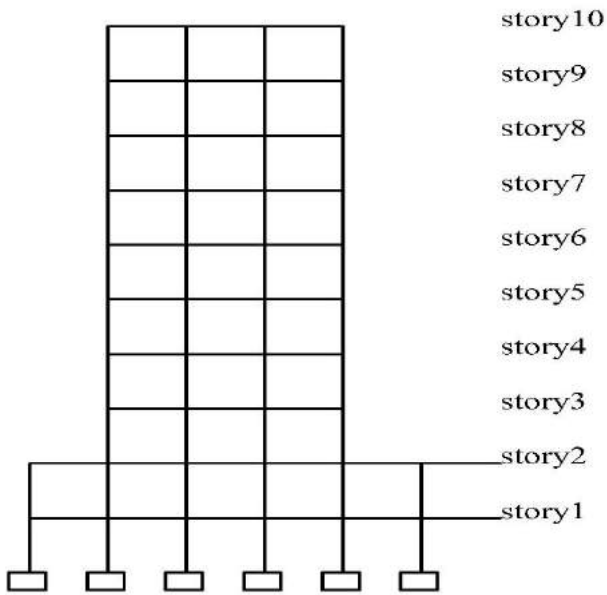
Fig. 7: Model 4, frame showing type (ii) irregular structure with irregularity ratio of 0.2
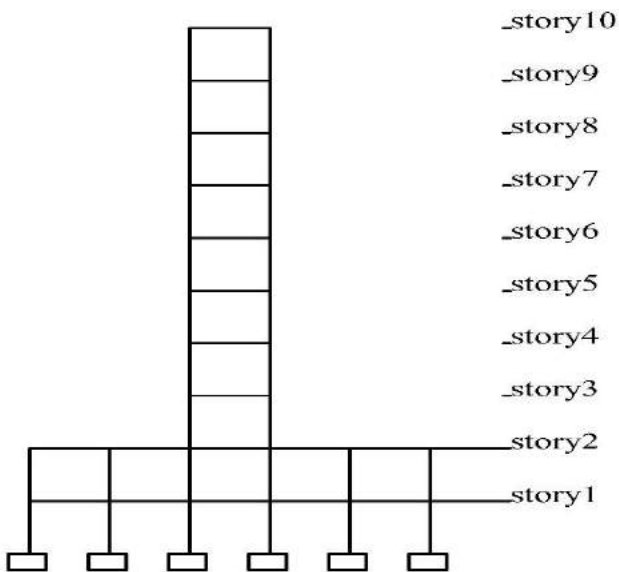
Fig. 8: Model 5, frame showing type (ii) irregular structure with irregularity ratio of 0.4
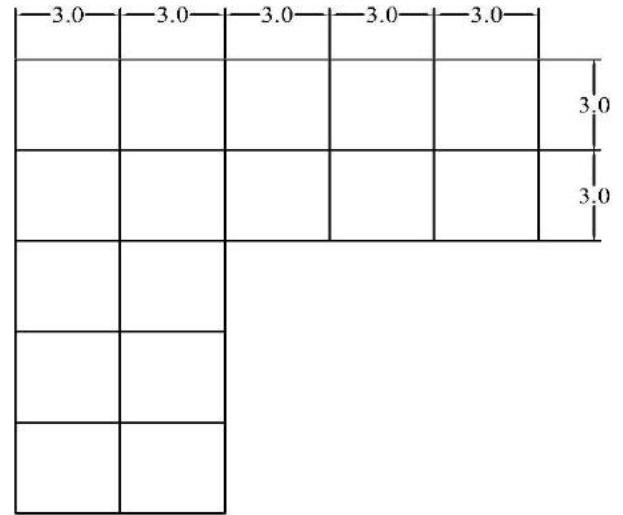
Fig. 10: Model 7, frame showing type (iii) irregular structure with irregularity ratio of 0.6
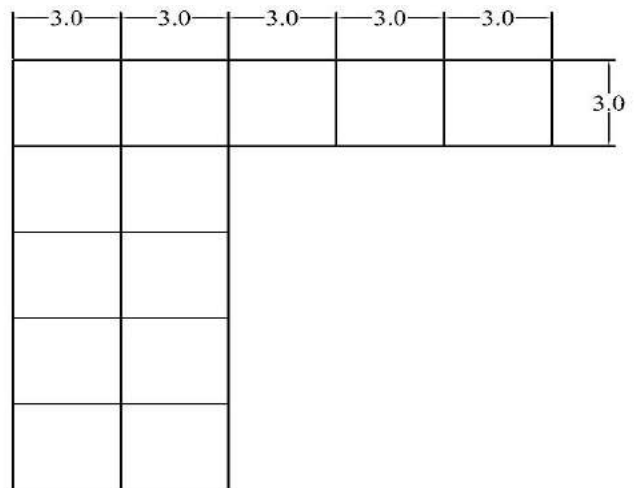
Fig. 11: Model 8, frame showing type (iii) irregular structure with irregularity ratio of 0.8
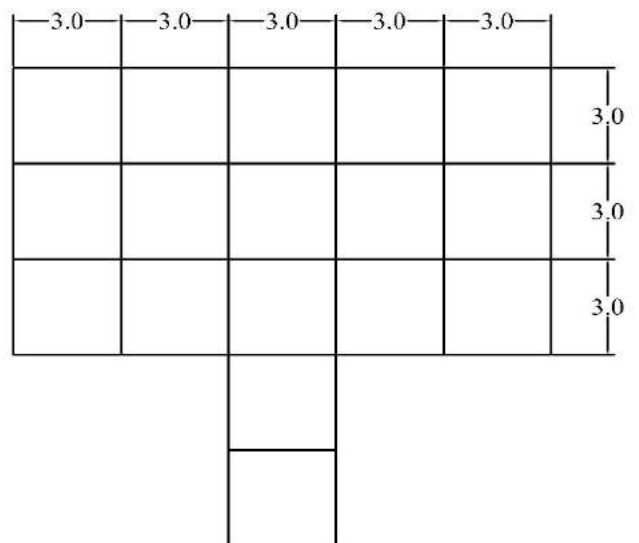
Fig. 12: Model 9, frame showing type (iv) irregular structure with irregularity ratio of 0.4

III. RESULTS AND DICUSSION

The results obtained from nonlinear pushover analysis are dis-cussed here. Fig. 15 to 20 shows the capacity curves comparing the irregular structural models with regular structural model. The variation of capacity curves in Y direction for irregular structures of type (ii) and type (iv) follows the similar trend as shown in Fig. 17 and Fig. 20 respectively.
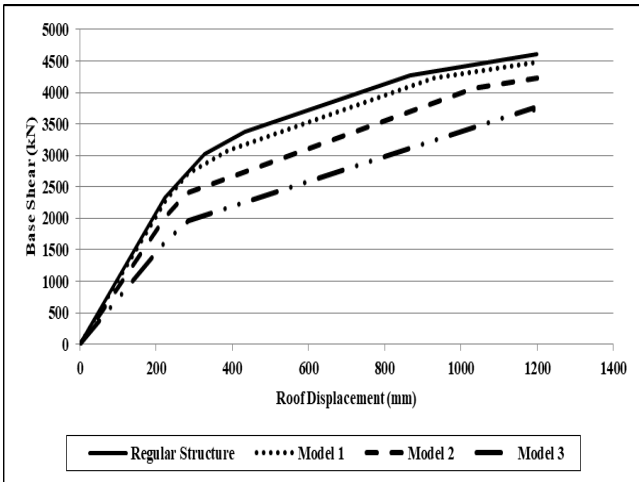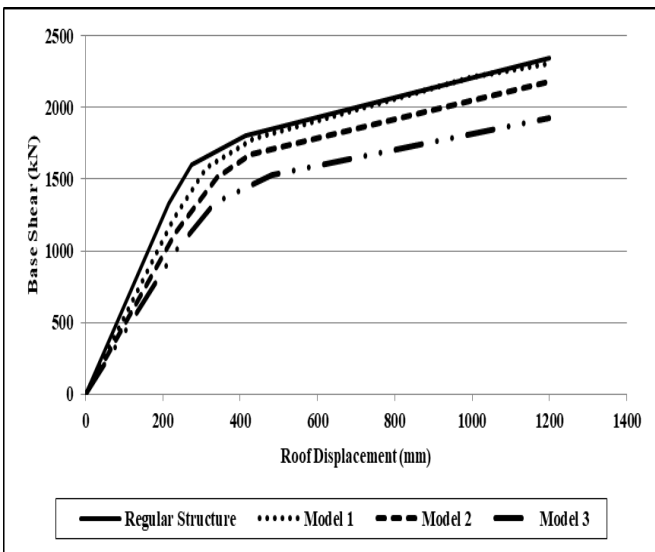
Fig. 17: Capacity curves, comparing vertical geometric irregularity of type (ii) structures with regular structure in X direction of earthquake
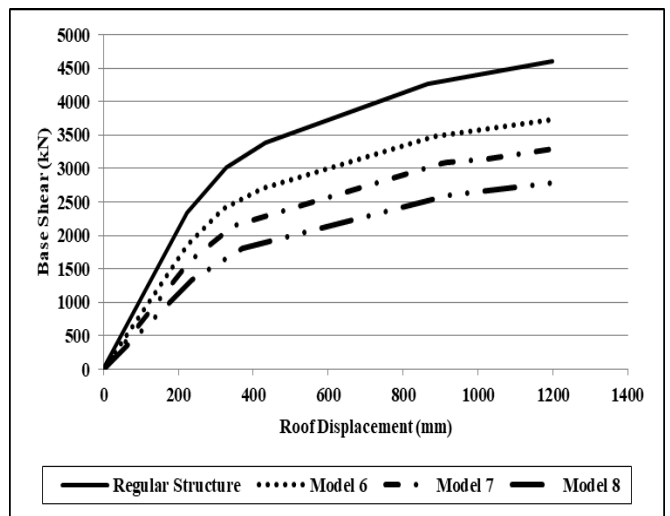
Fig. 15: Capacity curves, comparing vertical geometric irregularity of type (i) structures with regular structure in X direction of earthquake

Fig. 18: Capacity curves, comparing plan irregularity of type (iii) structures with regular structure in X direction of earthquake

Fig. 16: Capacity curves, comparing vertical geometric irregularity of type (i) structures with regular structure in Y direction of earthquake
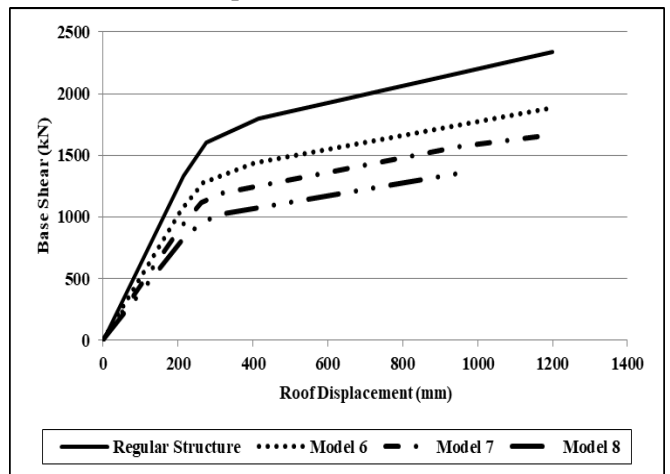
Fig. 19: Capacity curves, comparing plan irregularity of type (iii) structures with regular structure in Y direction of earthquake
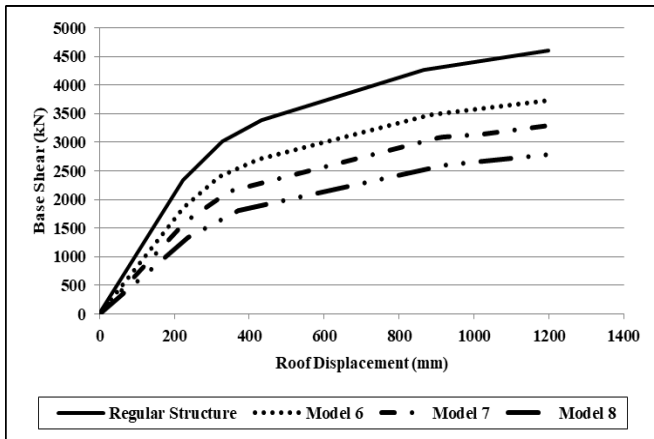
Fig. 18: Capacity curves, comparing plan irregularity of type (iii) structures with regular structure in X direction of earthquake
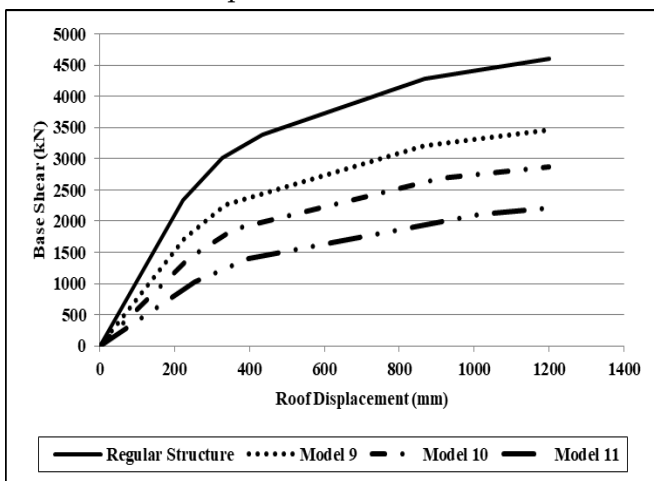
Fig. 20: Capacity curves, comparing plan irregularity of type (iv) structures with regular structure in X direction of earthquake

From Fig. 15 to 20, graph indicates that, as irregularity ratio increases, base shear carrying capacity of irregular structure decreases. Comparing roof displacement of all irregular structural models with roof displacement of regular structure, the values are almost same with few exception. There is reduction of 6.5% and 9% of roof displacement occurring in model 5 compared to regular structure in X and Y direction respectively. Whereas roof displacement is reduced by 18% in Y direction of model 8 compared to regular structure. The irregularity ratio of 0.4 have higher base shear

carrying capacity compared to all other irregularity ratios considered in the study. The stiffness in all structural configurations along X direction is more compared to Y direction, hence base shear carrying capacity of all the models in X direction is higher. From Fig. 15 to 20, base shear carried by the irregular structures is considerably reduced when compared to regular structure. Table 1 shows percentage decrease in base shear along X and Y direction.

From Table 1, vertical geometric irregularity of type (i), the models 1, 2 and 3 shows an average reduction in base shear carrying capacity of 2%, 9% and 18.5% when compared to regular structure respectively. Whereas vertical geometric irregularity of type (ii), the average reduction in base shear carrying capacity of model 4 and model 5 are 26% and 64% when compared to regular structure respectively. Hence vertical geometric irregularity of type (i) models have shown higher base shear carrying capacity compared to type (ii) From Table 1, plan irregularity of type (iii), the models 6, 7 and 8 shows an average reduction in base shear carrying capacity of 19%, 28% and 40% when compared to regular structure respectively. Whereas plan irregularity of type (iv), the average reduction in base shear carrying capacity of models 9, 10 and 11 are 25%, 38% and 52% when compared to regular structure respectively. Hence plan irregularity of type (iii) models have shown higher base shear carrying compared to type (iv) models for all irregularity ratios. The vertical geometrical irregularity of type (i) has higher base shear carrying capacity compared to all irregular configurations considered in the study.

Table 2 and Table 3 shows the base shear carried and displacement at performance point of structures for earthquake in X and Y direction respectively. From the Table 2 and Table 3 the base shear carrying capacity at the performance point of regular structure is higher compared to all irregular models considered. As the irregularity ratio increases the base shear carrying capacity at performance point decreases for both X and Y direction of earthquake.

In irregular models the model 2 carried higher base shear capacity compared to all configurations considered in the study.

TABLE 1: PERCENTAGE DECREASE IN BASE SHEAR FOR CORRESPONDING DIRECTION OF EARTHQUAKE

Structural models	Percentage decrease in base shear along in X direction (%)	Percentage decrease in base shear along Y direction (%)
Model 1	2.61	1.44
Model 2	8.20	7.05
Model 3	19.30	17.62
Model 4	26.13	26.47
Model 5	67.88	60.48
Model 6	18.77	19.34
Model 7	28.59	29.03
Model 8	39.34	41.66
Model 9	24.80	25.91
Model 10	37.56	38.85
Model 11	52.00	51.81

TABLE 2: THE BASE SHEAR CARRIED AND ROOF DISPLACEMENT AT PERFORMANCE POINT OF STRUCTURE FOR EARTHQUAKE IN X DIRECTION

Structural models	Performance point	
	Base shear (kN)	Base shear (kN)
Model 1	3639.88	360.22
Model 2	3196.81	354.53
Model 3	2552.29	348.74
Model 4	2481.46	351.81
Model 5	961.55	328.74
Model 6	3030.24	365.72
Model 7	2619.79	373.43
Model 8	2206.91	393.84
Model 9	2760.60	362.50
Model 10	2206.94	372.26
Model	1643.24	409.63

Structural models	Performance point	
	Base shear (kN)	Base shear (kN)
11		

TABLE 3: THE BASE SHEAR CARRIED AND DISPLACEMENT AT PERFORMANCE POINT OF STRUCTURE FOR EARTHQUAKE IN Y DIRECTION

Structural models	Performance point	
	Base shear (kN)	Base shear (kN)
Model 1	2829.74	526.64
Model 2	2495.44	516.19
Model 3	2057.33	477.22
Model 4	2030.35	449.27
Model 5	954.54	369.85
Model 6	2363.28	468.39
Model 7	2041.52	458.85
Model 8	1720.31	450.24
Model 9	2152.02	471.53
Model 10	1720.90	458.09
Model 11	1287.26	436.65

IV. CONCLUSION

Based on the result and discussion it can be concluded that, as irregularity ratio increases, base shear carrying capacity and performance point of irregular structure decreases. Regular structural model showed higher seismic performance in both X and Y direction compared to all irregular structural models considered. The vertical geometrical irregularity models of type (i) has higher seismic performance compared to all the irregular configurations considered in the study. Also vertical geometrical irregularity of type (ii) has least seismic performance compared to all the irregular configurations considered in the study

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Reuse and Recycling of Construction and Demolition Waste

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ABSTRACT

Due to rapid urbanization in India, environmental impacts from construction and demolition (C&D) waste are increasingly becoming a major issue in urban waste management. Construction and demolition waste is generated whenever any construction/demolition activity takes place. It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. A major part of this waste comes to the municipal stream. This study aims to focus on the possibilities of reuse, recycling and renovation in reducing C&D waste. Various practices of reuse and recycling like renovation, concrete recycling, and deconstruction were studied. Along with reduction in C&D waste these practices can reduce the exploitation of virgin natural resources. Renovation of existing residential building for new requirements was done to reduce the demolition waste produced. It helped in the onsite reuse of functional parts of existing building for the new building. In this particular study we were able to save the entire foundation, roofing frame, flat slab and 73.84% of wall for superstructure.

Keywords : Construction & demolition waste, deconstruction, renovation, recycling, reuse, material recovery

I. INTRODUCTION

Parallel to rapid urbanization in India, environmental impacts from construction and demolition (C&D) waste are increasingly becoming a major issue in urban waste management. C&D waste management in India and other developing countries is relatively underdeveloped and emerging. Particularly in mega-cities, where rapid population growth and economic development is evident, an increasing growth of built environment is also manifested. This built environment includes the urban infrastructures, high rise commercial buildings and residential buildings, among others. Construction, renovation, and demolition activities of the built environment cause C&D waste contributing to one of the major environmental burdens. Furthermore, these environmental burdens

of waste emission continue with current poor solid waste management and limited solid waste facilities which are evident in most of mega-urban centers. Apart from this construction Industry is the largest sector in respect of consumption of energy. It consumes around 2/5th of the total consumed energy throughout the world. Resource utilization in case of construction industry amounts to half of the total resource used all over the world.[1]

Construction and demolition waste is generated whenever any construction/demolition activity takes place. It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. A part of this waste comes to the municipal stream. These wastes are heavy, having high density, often bulky and occupy considerable storage space either on the road or

communal waste bin/container. Waste from small generators like individual house construction or demolition, find its way into the nearby municipal bin/vat/waste storage depots, making the municipal waste heavy and degrading its quality for further treatment like composting or energy recovery. A large part of it from bulk generators goes to existing landfills, eating into their spaces. [1]

It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. It constitutes about 10-20 % of the municipal solid waste (excluding large construction projects). While some of the items like bricks, tiles, wood, metal etc. are re-used and recycled, concrete and masonry, constituting about 50% of the C&D waste is not currently recycled in India. The fine dust like material (fines) from C&D waste is presently not being used and thus wasted.

C&D waste requires focus primarily in view of (i) its potential to save natural resources (stone, river sand, soil etc.) and energy (ii) its bulk, which is carried for long distances without any proportionate return (iii) the space it occupies at the sanitary landfill site unless the fines are used as landfill cover, (iv) its potential for spoiling processing of biodegradable as well as other recyclable waste. On the other hand it has potential use after processing and grading. There is a huge demand of aggregates in the housing and road sectors but there is significant gap in demand and supply, which can be reduced by recycling construction and demolition waste to certain specifications. Thus, its presence in terms of quantity as well as its importance is growing. So far in India there is very little effort to manage and utilize construction and demolition waste.[1]

CONSTRUCTION & DEMOLITION WASTE

Construction and demolition waste is generated whenever any
Construction/demolition activity takes place, such as, building roads, bridges, flyover, subway, remodeling etc. It consists mostly of inert and non-biodegradable

material such as concrete, plaster, metal, wood, plastics etc. A part of this waste comes to the municipal stream.

These wastes are heavy, having high density, often bulky and occupy considerable storage space either on the road or communal waste bin/container. It is not uncommon to see huge piles of such waste, which is heavy as well, stacked on roads especially in large projects, resulting in traffic congestion and disruption. Waste from small generators like individual house construction or demolition, find its way into the nearby municipal bin/vat/waste storage depots, making the municipal waste heavy and degrading its quality for further treatment like composting or energy recovery. Often it finds its way into surface drains, choking them. It constitutes about 10-20 % of the municipal solid waste (excluding large construction projects). [1]

It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. Projections for building material requirement of the housing sector indicate a shortage of aggregates to the extent of about 55,000 million cu.m. An additional 750 million cu.m. aggregates would be required for achieving the targets of the road sector. Recycling of aggregate material from construction and demolition waste may reduce the demand-supply gap in both these sectors.[1]

While retrievable items such as bricks, wood, metal, titles are recycled, the concrete and masonry waste, accounting for more than 50% of the waste from construction and demolition activities are not being currently recycled in India. Recycling of concrete and masonry waste is, however, being done abroad in countries like U.K., USA, France, Denmark, Germany and Japan.[1]

STORAGE OF CONSTRUCTION AND DEMOLITION WASTE

C&D wastes are best stored at source, i.e., at the point of generation. If they are scattered around or

thrown on the road, they not only cause obstruction to traffic but also add to the workload of the local body. All attempts should be made to stick to the following measures:

1. All construction/demolition waste should be stored within the site itself. A proper screen should be provided so that the waste does not get scattered and does not become an eyesore.

2. Attempts should be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.

3. Material, which can be reused at the same site for the purpose of construction, leveling, making road/pavement etc. should also be kept in separate heaps from those, which are to be sold or land filled.

4. The local body or a private company may arrange to provide appropriate number of skip containers/trolleys on hire which may be parked at the site and removed with skip lifters or tractors as the case may be.

5. Whenever a new streamlined system is introduced in a municipality, the local body may consider using its old vehicles, especially, tractors and trailers or old Lorries or tippers for this purpose.

6. For large projects involving construction of bridges, flyovers, subways etc., special provision should be made for storage of waste material. Depending on the storage capacity, movement of the waste has to be planned accordingly. Otherwise, it would result in job constraint as well as traffic bottlenecks.

7. This subject is often neglected in case of repair/maintenance of roads, water pipes, underground telephone and electric cables etc. It is not uncommon to see that after such work, the waste remains piled for months on the roads or pavements. The concerned departments and contractors must co-ordinate with the municipality for removal of the debris generated. The municipality while giving permission for

such work should clearly sort out the issue of removal of the debris and should insist that immediately after the job is over, the road should be repaired and brought back to its normal shape. [1]

RECYCLING AND REUSE OF C&D WASTE

The use of these materials basically depends on their separation and condition of the separated material. A majority of these materials are durable and therefore, have a high potential of reuse. It would, however, be desirable to have quality standards for the recycled materials. Construction and demolition waste can be used in the following manner: [1]

1. Reuse (at site) of bricks, stone slabs, timber, conduits, piping railings etc. to the extent possible and depending upon their condition.

2. Sale / auction of material which cannot be used at the site due to design constraint   or change in design.

3. Plastics, broken glass, scrap metal etc. can be used by recycling industries.

4. Rubble, brick bats, broken plaster/concrete pieces etc. can be used for building activity, such as, leveling, under coat of lanes where the traffic does not constitute of heavy moving loads.

5. Larger unusable pieces can be sent for filling up low-lying areas.

6. Fine material, such as, sand, dust etc. can be used as cover material over sanitary landfill.

Metropolitan and mega cities usually generate huge quantities of wastes because of large-scale building and other developmental activities. They may identify suitable sites where such waste can be temporarily stored and some physical treatment can be carried out. [1]

DISPOSAL OF C&D WASTE

Being predominantly inert in nature, construction and demolition waste does not create chemical or biochemical pollution. Hence maximum effort should be made to reuse and recycle them as indicated above. The material can be used for

filling/leveling of low-lying areas. In the industrialized countries, special landfills are sometimes created for inert waste, which are normally located in abandoned mines and quarries. The same can be attempted in our country also for cities, which are located near open mining quarries or mines where normally sand is used as the filling material. However, proper sampling of the material for its physical and chemical characteristics has to be done for evaluating its use under the given circumstances. [1]

CHALLENGES IN C&D WASTE RECYCLING

C&D waste is a major component of the solid waste stream, which should be recognized as a valuable resource as large quantities of it could either be reused or recycled. C&D waste has been mostly overlooked in the efforts to reduce waste sent to landfill, with the emphasis being placed on domestic reuse and recycling. With this view, Asian countries have a problem of disposal sites of which C&D waste largely account to it. Environmental issues such as increase in volume and type of waste, resource depletion, shortage of landfill and illegal dumping, among others are evident in countries in the region. Furthermore, the Asian countries have limited or no available data on C&D waste and the management aspects, particularly with regards to their C&D waste generation and composition; practices and policy, key actors and stakeholders' participation and available technology related to 3Rs. Most of the local governments do not recognize and include C&D waste in their waste management plan. [1]

CONCRETE RECYCLING

Concrete is a composite construction material composed primarily of aggregate, cement and water. Concrete is everywhere. Concrete is widely used for making architectural structures, foundations, brick/block walls, pavements, bridges/overpasses, motorways/roads, runways, parking structures, dams, pools/reservoirs, pipes, footings for gates, fences and poles and even boats. Twice as much concrete is used in construction around the world than the total of all other building materials, including wood, steel, plastic and aluminium. Concrete is extremely durable and can last for hundreds of years in many applications. Concrete is an excellent material to make long-lasting and energy-efficient buildings. However, even with good design, human needs change so buildings will be demolished and thus potential waste will be generated. [6]

Concrete has fairly unique properties and its recovery often falls between standard definitions of reuse and recycle. Concrete is rarely able to be "reused" in the sense of being reused in its original whole form. Nor is it "recycled" back into its original input materials. Rather, concrete is broken down into smaller blocks or aggregate for use in a new life. So generally "recycled concrete" refers to concrete that has been diverted from waste streams and reused or recovered for use in a new product. Concrete recycling is a well established industry in many countries and most concrete can be crushed and reused as aggregate.[6]

Concrete can be recycled from:
- Returned concrete which is fresh (wet) from ready mix trucks
- Production waste from a pre-cast production facility
- Waste from construction and demolition

The most significant source is demolition waste.

It is a material that can last for a very long time, and most concrete waste is generated not because the concrete is worn out, but usually because the structure itself has become redundant with changing infrastructure needs and planning. In some countries near full recovery of concrete is achieved, in most parts of the world the potential to recover concrete is overlooked and it ends up as unnecessary waste in landfill. Extraction of materials for aggregates like broken stone, sand etc create significant environmental degradation, pollution and energy consumption. Recycling of concrete can replace a considerable amount of natural aggregate required

for the production of concrete and other purposes like road construction. [6]

DECONSTRUCTION

Deconstruction is a relatively recent practice in which buildings are carefully dismantled to salvage components for reuse and recycling. Its benefits include reducing the amount of construction and demolition (C&D) waste going to landfills, conserving resources through recycling, generating marketable products from salvage, providing job training to low and unskilled workers, and creating jobs. Deconstruction is a process of building disassembly in order to recover the maximum amount of materials for their highest and best re-use. Re-use is the preferred outcome because it requires less energy, raw materials, and pollution than recycling does in order to continue the life of the material. As a consequence of deconstruction, there are also many opportunities for recycling other materials along the way. [7]

Deconstruction combines the recovery of both quality and quantity of reusable and recyclable materials. The re-use of materials can serve a broad set of goals including the provision of low-cost building materials to a community, and the avoidance of demolition debris going to landfills. [7]

The deconstruction process roughly follows the reverse of the construction process. The premise is that materials which have been put on last will come off first. Variations occur for whole building sections, for example, an addition will be removed in its entirety separately from the rest of the building. The practice of focusing on each material type in a reverse order of the construction process is more efficient for separating materials for reuse, recycling, and disposal at the time of removal. Additions are an impediment to removing one type of material or whole sections of the original structure, but can provide a working surface for other parts of the

building, and be structurally dependent on other parts of the building.

EPA ON DECONSTRUCTION

According to the Old Research Report on Recycling; Training Programs; Environmental Protection Department; Demolition EPA defines "deconstruction" as the disassembly of buildings to safely and efficiently maximize the reuse and recycling of their materials. While windows, doors and light fixtures are routinely salvaged as part of standard demolition practice, deconstruction also aims to save and reuse flooring, siding, roofing, and framing where these materials have retained their value. In some cases, EPA notes, deconstruction can save materials that are otherwise not available, such as old-growth Douglas fir and redwood lumber. [8]

EPA calls deconstruction a "grave-to-cradle" program that helps take care of the enormous stock of buildings reaching the end of their useful lives while simultaneously reducing the pressure to mine or harvest natural resources for new construction, reducing the need for landfill space, and creating new jobs. [8]

According to EPA, construction activities consume 60% of the total raw materials used in the U. S. economy. EPA estimates that 136 million tons of building-related C&D waste is generated annually, of which 92% is from renovation and demolition work. Only 20 to 30% of C&D waste is being recycled. [8]

Deconstruction provides the following environmental benefits:-

- Reducing the C&D waste stream, saving landfill space.
- Saving natural resources that would otherwise be used, reducing the need for, and environmental impacts of, mining and timber-cutting.
- Saving energy by reusing and recycling materials.

Reducing job site pollution from dust, airborne lead and asbestos

Deconstruction provides the following social benefits:

- Creates jobs because it requires more labour.
- Deconstruction's basic skills are easily learned, enabling unskilled and low-skilled workers to receive on-the-job training.

TYPICAL METHODS OF DECONSTRUCTION

Deconstruction is commonly separated into two categories; structural and non-structural. Non-structural deconstruction, also known as "soft-stripping", consists of reclaiming non-structural components, appliances non doors, windows, and finish materials. The reuse of these types of materials is commonplace and considered to be a mature market in many locales. [8]

Structural deconstruction involves dismantling the structural components of a building. Traditionally this had only been performed to reclaim expensive or rare materials such as used brick, dimension stone, and extinct wood. In antiquity, it was common to raze stone buildings and reuse the stone; it was also common to steal stones from a building that was not being totally demolished: this is the literal meaning of the word dilapidated. Used brick and dimension limestone in particular have a long tradition of reuse due to their durability and color changes over time. Recently, the rise of environmental awareness and sustainable building has made a much wider range of materials worthy of structural deconstruction. Low-end, commonplace materials such as dimensional lumber have become part of this newly emerging market. [8]

RENOVATION

Renovation is the process of modifying an existing structure to suit the modern requirements of users. This is an existing practice locally but not widely practiced and it can enable the reuse of building materials producing material savings. Buildings are usually demolished not because they are completely damaged and become useless, but usually because the building itself has become redundant with changing needs and lifestyle. Therefore instead of demolishing the existing building and constructing a new building, existing building can be modified to suit the current needs. This can considerably reduce the amount of demolition waste generated. This is an alternative that should be considered before the demolition of any building.

CASE STUDY

In order to make an assessment of the renovation process in material savings we have done a case study on a renovated building. It is a residential building in, Kollam, Kerala, India.

DETAILS OF OLD BUILDING

Total area   : 196.98m² (excluding porch)
Roof   : Sloping tiled roof, RCC flat roof 10cm thick
Floor   : Mosaic floor
Plastering   : Cement Plastering.
Walls   : 20 cm thick laterite wall.

Existed old building had various issues like:
- Inadequate ventilation
- Insufficient daylight
- Outdated fashion
- Outdated function
- Inadequate living space

In order to overcome the above mentioned difficulties and to satisfy the requirements of the residents the house had been renovated. We compared both the buildings with available data on both like building drawings and data collected during the site visit and documentation of the renovated building by our project team.

DETAILS OF RENOVATED BUILDING

Total area   : 196.98m² (excluding porch)
Roof   : Sloping tiled roof, RCC flat roof 10cm thick

Floor   : Vitrified tiles
Plastering   : Cement Plastering
Walls   : 20 cm thick laterite wall

FOUNDATION

Foundation of the old building did not have any settlement or weakness, therefore existed foundation is completely retained for the renovated building. 5.12m of new wall is constructed to make minor changes in the plan new foundation is given for this much length.

According to this almost entire foundation for the renovated building is retained from the old building. This means the saving of 71.13m³ of foundation material which was needed to provide foundation for the new building. Currently demolition waste from random rubble masonry is not recycled or reused except for usable rubble after demolition in some cases. So retaining effectively reduced the demolition waste. This can be considered as the reuse of existed foundation in the renovated building which leads to the saving of material and reduction in waste production.

WALLS

The major issue that was addressed in the renovated building is lack adequate space for living and dining areas and ventilation and lighting in the interior parts of the building. For this purpose some of the interior walls of the building were removed some small partition walls are added. This was one of the major restructuring processes in the renovation of this building. Changes in the superstructure have lead to the removal and addition of considerable amount of brick work. Walls of the old building were of laterite and the newly added partitions and walls were of brick masonry.

According to the calculations is 26.16% (17.09m³) of laterite wall is removed and 17.22% (11.25m³) of brick wall is added in the renovation of the building. This means 73.84% of laterite wall in the old building is retained in the renovated building. This saved 48.24m³ of brick masonry needed for the

construction of the building if the old building was completely demolished. It also reduced the amount of demolition waste from the superstructure by about 74% and reuse of the same amount of material in the new building.

Table1: Total quantity of wall of superstructure

SL N o.	Descrip tion	Numb ers	Leng th (m)	Brea dth (m)	Heig ht (m)	Quant ity (m³)
1	Laterite wall 20cm thick	1	133. 26	0.2	3	79.9
	Deducti ons					
2	Door 1	17	1	0.2	2	6.8
3	Door 2	15	0.9	0.2	2	1.44
4	Openin g	1	2	0.2	3	1.2
5	Windo w 1	5	1.5	0.2	1.5	2.25
6	Windo w 2	9	1	0.2	1.5	2.7
8	Ventilat or	3	0.9	0.2	0.5	0.24
	Total Deducti on					14.63
	Total					65.33

Table 2: Total quantity of wall removed

SL No.	Description	Numbers	Length (m)	Breadth (m)	Height (m)	Quantity m³
1	Laterite Wall 20cm thick	1	31.82	0.2	3	19.09
	Deductions					
2	Door 1	1	1	0.2	2	0.4
3	Door 2	4	0.9	0.2	2	1.6
	Total Deduction					2
	Total					17.09

Table 3: Quantity of wall added

SL No.	Description	Numbers	Length (m)	Breadth (m)	Height (m)	Quantity (m³)
1	10cm wall	1	5.99	0.1	3	1.797
2	20cm wall	1	15.75	0.2	3	9.45
	Total					11.25

ROOFING

The roof provided in the old structure was a combination of both flat roof and tiled sloping roof. The tiled sloping roof in the rear half of the building and the front half of the building was RCC flat roof. The roof frame of tiled roof had no considerable damage and the flat roof had leaking problems which had to be addressed to retain it. In the renovated building the entire roof frame is retained to provide roofing for the rear half of the building. The roofing tiles were replaced with GI sheets in order to reduce the load on the structure. The purlins provided earlier where not in the same level, thus replacement of the tiles with GI sheet was affected. The GI sheets would bend along the unlevelled purlins. New purlins of rectangular steel tubes were provided at 2m distance to hold the sheets. Old timber purlins were retained as removing them was an unnecessary operation. The flat roof at the front portion of the building had leakage problems which had to be solved at minimum cost. Demolition and reconstruction of the flat roof was not economical. The best solution was to erect steel trusses and lay GI sheets over them. This provided uniformity in the structure which was a boost to its aesthetics.

In this renovation adopted for roofing entire roof frame and flat slab is reused in the renovated building, which saved the materials to provide new roofing for the new building. The removed roofing tiles have an existing market where they are sold for reuse. Retaining of the flat roof by addressing the leaking problem by providing a sloping GI sheet roof not only reduced the demolition concrete waste, which is not currently recycled in India, but also prevented the difficult process of demolition of flat slab which can damage the walls it is supported on.

DOORS AND WINDOWS

The doors and windows initially used were not of standard size and their placement and size according to the renovated design was different to provide adequate lighting and ventilation. Therefore the entire frames and shutters of doors and windows were replaced by new ones .Number of windows in the old building was increased due to insufficient lighting.

The doors and windows removed from old building can be reused and there is an existing market for them where they are sold for reuse or they are used to make components for new timber products.

FLOORING

Initially the flooring provided was mosaic. It had minor damages and low aesthetic appeal. New flooring was provided using vitrified tiles over the existing floor to improve its aesthetic appearance.

Conclusion

According to our assessment this renovation process has achieved considerable material savings. The amount of demolition waste produced is reduced to a great extend. Renovation provides an opportunity to reuse the functional parts of the old building in the renovated building as such for the same function or with necessary modification by retaining them in the renovated building. In this particular study we were able to save the entire foundation, roofing frame, flat slab and 73.84% of wall for superstructure. Renovation also promotes deconstruction instead of demolition in order to prevent damage to parts of building which is to be retained, which can increase the amount of reusable material extracted from the building. Possibilities of renovation should always be considered before the demolition of any building.

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Bengaluru City Water Quality Testing

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ABSTRACT

Physical assessment of drinking water quality was carried out for the samples taken in Bangalore, India. Being one of the fatest growing cities in india, inevitably Bangalore is facing the pressure of supplying safe and healthy drinking water to such a huge population. Therefore it is of high importance quality in such place. In this present study water samples were collected from all over Bangalore peripheral regions as well as proportions from the central region as well. Test for pH and TDS were carried 20 samples. The whole city was divided in four regions for well parameter was found to fairly exceed the standard values in certain places. All the unfitness of the water may has occurred due to the poor storage and maintenance system. All the limit came high in some sector depending upon external sources. It is evident that more than 50 percent of water samples are non portable as per Indian standard

Keywords : pH, total dissolved solids, water analysis and Quality assessment.

I. INTRODUCTION

Our planet Earth is a live planet because of some special ingredients out of which water plays a great role. Water has been considered as the most important and vital resource for the upbringing of biological sphere as well as the human civilisation. The other agents which are responsible for the biosphere on globe are Air, Heat, Soil, Sky. All these agents are linked in between themselves to a much greater extent and any irregularities in one of them affects others as well. Along with the progress of our civilisation, these resources have begun being polluted and its quality started depleting due to various reasons like the onset of industries, domestic wastes, runoff from urban areas, urban and rural garbage.

With the onset and progress of human civilisation, it has constantly been observed that the coastal areas as well as the river banks have been the most populated spots on account of the availability of ample water resources for the maintenance of daily life along with farming and other climatic advantages. The cities and towns always have shown the rising trend of population because of the easy earning sources due to the various industries which are setup to meet the increasing demand of the growing civilisation. Because of this, day by day urban areas are being densely populated and as a result, the surrounding areas of cities are suffering from various kinds of pollutions like air, water, soil pollution and many more due to sewage, garbage, dumps and barnyard manures etc.

The majority of water for Bangalore is imported by the BWSSB from the Cauvery river, over 100 km south of the city Cauvery water was originally drawn from a reservoir near the village of Thorekadanahalli. Up to 20% of the normal water supply for Bangalore comes from the Arkavathy river, from two reservoirs built on the river, the

Hesaraghatta built in 1894 and Tippagondanahalli Reservoir, which was built in 1933. BWSSB currently supplies approximately 900 million litres (238 million gallons) of water to the city per day, despite a municipal demand of 1.3 billion litres.

Universally, requirement for freshwater will continue to rise significantly over the coming decades to meet the needs of increasing populations, growing economies, changing lifestyles and evolving consumption patterns. This will greatly amplify the pressure on limited natural resources and ecosystems. Unsafe water and sanitation account for almost one tenth of the global burden of disease. According to the World Commission on water for the 21st century, more than half of the world's major rivers are depleted and contaminated to the extent that they threaten human health and poison the surrounding ecosystems (Interpress, 1999). Contaminated drinking water can cause various diseases such as typhoid fever, dysentery, cholera and other intestinal diseases.

In India, rivers are an important source of water, as many Indian cities are situated on the banks of the rivers. Untreated discharge of pollutants into a river from domestic sewers, storm water discharges, industrial wastewaters, agricultural runoff and other sources can have short-term as well as long-term effects on the water quality of a river system. Total 80% of the water in India has become polluted due to the discharge of untreated domestic sewage and partially-treated industrial effluents into the natural water source. High levels of pollutant input in river water systems cause an increase in biological oxygen demand (BOD), chemical oxygen demand(COD), total dissolved solids (TDS), total suspended solids (TSS), metals such as Cd, Cr, Ni and Pb, and fecal coliforms (Mohd Kamil,1991; Sangodoyin, 1991; Chatterjee et al., 2000; Adekunle and Eniola, 2008).

In the study area considered, peoples are using contaminated water for various purposes and are facing different health problems. Hence, the present study aims at assessment of water quality in the area considered and suggesting

mitigate measures for the problems related to water pollution. An understanding of water chemistry is the bases of the knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare.

1.1 OBJECTIVES OF THIS PROJECT

There are two types of objectives here: - narrative and numerical.

- Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management.
- Narrative objectives also serve as the basis for the development of detailed numerical objectives.
- numerical objectives were developed primarily to limit the adverse effect of pollutants in the water column.
- Numerical sediment objectives, that will ensure the protection of all current and potential beneficial uses.
- Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms.
- These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses.

These water quality objectives are considered necessary to protect the present and potential beneficial uses and to protect existing high quality waters of the state. These objectives will be achieved primarily through establishing and enforcing waste discharge requirements and by implementing this water quality control plan

2. STUDY AREA:

The chemical analysis of drinking water study was performed in Bangalore Urban District dividing the whole city into six meta divisions i.e. North, East, South-East, South, West and Central. Bangalore is the capital city of Karnataka with a geographical location of latitude 12o.58N and longitude of 77o.35E, 921 m above the sea level. Historically, Bangalore Water Supply and Sewage Board (BWSSB) used to supply the drinking water i.e. Cauvery river water, to the central region of the Bangalore as it was the main populated and core region of the city. But, the peripheral regions have recently being populated because of the rapid urbanization and industrialization. Hence, the drinking water supply has become inadequate enough to supply water throughout the city now developed. The current situation, obviously compelling the dwellers to procure drinking water from alternative sources such bore wells, tankers which is in turn is nothing but the ground water. This urbanization phenomenon in developing countries like India with still developing sanitation and safe water supply protocols is leading to consumption of contaminated water in several occasions leading to serious health concerns. Hence; it is of urgent and immense importance to scrutinize the drinking water quality in these areas and the same has been determined in this study.

2.1 Sampling: In order to keep the sample collection and analysis less complex and well organized, the whole Bangalore was divided into four meta-divisions as North East, South-East, South West North West each of these divisions containing several numbers of wards. Each house in each of these wards was assigned with a number and was then selected by generating random number generating tools. The house owners were questioned about the cleanliness measures followed to ensure the drinking water safety and with their consent 500 ml of bore water sample was collected in a sterilized polyethylene bottles and were carried to lab and were stored at 40C. Later the samples were tested for

the mentioned parameters. The samples of waters were collected in month of February 2016 and later water from same areas have been collected in month of March 2016 and experiments have been done twice simultaneously in March and April 2016.

3.3 Analysis: The collected and stored samples were subjected to testing for pH according EPA method. The samples were performed for various test written below and the results of these tests are compared with **BIS105001991** and **WHO 2011** to know the quality of water.

Table 1: Analysis on test done and methods used in them

SL NO.	PARAMETER	METHODS	INSTRUMENTS
1.	PH	PAPER METHOD	————
2.	DISSOLVED OXYGEN	TITRATION BY SODIUM THISULPHATE	————
3.	CONDUCTIVITY	ELECTROMETRIC	CONDUCTIVITY METER
4.	TOTAL DISSOLVE SOLIDS	ELECTROMETRIC	————
5.	CALCIUM HARDNESS	TITRATION BY EDTA	————
6.	MAGNESIUM HARDNESS	TITRATION BY EDTA	————

7.	TOTAL HARDNESS	TITRATION BY EDTA	_____
8.	CHLORIDES IN WATER	TITRATION BY AgNO3	
9.	IRON	DIGESTION FOLLOWED	ATOMIC ABSOROTION

		BY ATOMIC SPECTROMETRY	SPECTROMETER
10.	SULPHATE	TURBIDIMETRIC	TURBIDITY METER
11.	NITRATE	ULTRA VIOLET SCREENING	UV-SPECTROPHOTOMETER

3. MATERIALS REQUIRED

Table 2 : Name of the reagents used in the tests

A. **WATER-SAMPLE**		
B. **REAGENTS**		
SL NO	PARAMETER	REAGENTS
1	ELECTRICAL CONDUCTIVITY	(0.1N) KCL
2	PH	pH paper
3	CHLORIDES IN WATER	(0.0141N) SILVER NITRATE, POTASSIUM CHROMATE SOLUTION
4	CALCIUM HARDNESS AND MAGNESIUM HARDNESS	STANDARD EDTA(O.O1M), (1N) SODIUM HYDROXIDE, MUROXIDE INDICATOR
5	TOTAL HARDNESS	(0.01M) EDTA, AMMONIA BUFFER SOLUTION, ERICHROME BLACK T INDICATOR
6	DISSOLVED OXYGEN	MANGANESE SULPHATE, ALKALI IODIDE AZIDE, CONCENTRATED SULPHURIC ACID, STARCH INDICATOR, SODIUM THIOSULPHATE (0.025N)
7	CHLORIDE IN WATER	CHLORINE WATER, POTASSIUM IODIDE, GLACIAL ACETIC ACID, STARCH, (0.1N) SODIUM THIOSULPHATE
8	IRON TEST	HYDROCHLORIC ACID, HYDROXYLAMINE HYDROCHLORIDE SOLUTION, AMMONIUM ACETATE BUFFER SOLUTION, PHENANTROLINE SOLUTION, STOCK IRON SOLUTION, STANDARD IRON SOLUTION

9	NITRATE TEST	STANDARD SILVER SULPHATE, PHENOL DISULPHONIC ACID, AMMONIUM HYDROXIDE, STOCK NITRATE SOLUTION, STANDARD NITRATE SOLUTION
10	SULPHATE TEST	GLYCEROL, CONCENTRATED HYDROCHOLINE SOLUTION, ETHYL ALCOHOL, SODIUM CHLORIDE, BARIUM CHLORIDE CRYSTALS, STANDARD SULPHATE SOLUTION

Fig 1. Locations in Bangalore from where water samples are collected

3. 1 NAME OF LOCATION

The areas from where water was collected are divided in each zone as:

NORTH EAST REGION (zone 1)
- KR PURAM
- MAHADEVPURA
- KAMANAHALLI
- INDIRANAGAR
- WHITEFIELD

NORTH WEST REGION (zone 2)
- YESHWANTPUR
- RAJAJI NAGAR
- MALLESHWARAM
- MAJESTIC
- GOLF COURSE ROAD

SOUTH EAST REGION (zone 3)
- MARATHAHALLI
- DEV ANABISANAHALLI
- SARJAPURA ROAD
- HSR LAYOUT
- KORAMANGLA

SOUTH WEST REGION (zone 4)
- JAYANAGAR
- JP NAGAR
- BANSHANKARI
- KUMARSWAMI LAYOUT
- KENGERI

4.RESULT AND DISSCUSSIONS

Twenty groundwater samples (1 to 20) were collected from the bore-wells which included hand pumps, piped water supply schemes. The results of the chemical analysis are presented in the critical parameters along with the permissible limits for these parameters.

- ➤ **Odour** of sub surface water is agreeable but 6 surface water samples out of 20 samples are non-agreeable due to decomposition of organic matter and not fit for domestic and other purpose.
- ➤ **Taste** at all point of sample collection (100%) is non-agreeable hence objectionable.

The following values of parameters have come after performing experiments in each of them with various water sample collected

Table 3. Results on quality of water has shown during February -March 1016

NAME	PH	CONDUCTIVITY	CA HARDNESS Mg/l	MG HARDNESS Mg/l	TOTAL HARDNESS Mg/l	DISSOLVE OXYGEN Mg/l	CHLORIDE IN WATER Mg/l	IRON Mg/l	SULPHATE Mg/l	NITRATE Mg/l	TDS Mg/l
ZONE-1											
K R PURAM	7.3	1.2	350	175	525	0.1	405.87	1.5	297	101	2500
WHITEFIELD	6.9	0.9	76	250	326	0.9	89.96	1	96	31	2000
MAHADEVPURA	6.9	1	635	129	764	0.1	260.92	1.4	320	105.6	2850
INDRA NAGAR	7	0.9	75	165	240	1	79.75	0.5	8	22	1446
KAMMANAHALLI	7.1	0.8	125	189	314	1.2	117.96	0.8	10	33	1855
ZONE-2											
KANGERI	7.1	0.6	149	186	335	2.1	113.96	0.6	8	31	1807
BANASHANKARI	5.6	0.4	25	238	263	1.8	100.96	0.5	20	29	2202
JP NAGAR	5.9	0.9	20	240	250	1.6	106.96	0.6	9	28.6	1907
JAYNAGAR	7.3	0.8	195	130	325	2.3	75.97	0.5	10	25	1920
KUMARSWAMY LAYOUT	6.8	0.9	155	181	336	1.8	168.94	0.5	17	29.8	1800
ZONE-3											
YESWANTPUR	7	1.1	192	139	331	0.2	209.93	1	330.6	81	2500
RAJAJI	7.4	1	55	214	269	1	202.94	0.7	234.2	55.6	2350
MALLESHWARAM	8.1	1	166	128	294	1.2	325.1	0.8	85	35.7	2401
MAJESTIC	6.6	0.9	235	120	355	0.2	283	1.2	159	55.6	2471
GOLF COURSE	7.2	0.9	50	170	220	1.9	74.97	0.4	5	17.5	1200
ZONE-4											
HSR LAYOUT	7.3	0.7	63	185	248	1.5	95.2	0.6	6	20	1796
DEVANABISAHALLI	7.1	0.4	105	293	398	0.1	360.5	1.2	20	38.2	1850
KORAMANGLA	6.9	0.7	75	205	280	1.5	295.22	0.8	14	28	1700
SARJAPUR ROAD	7	0.5	200	120	320	1.2	297.9	1	13	33	1989
MARATHAHALLI	7.4	0.5	160	240	400	0.1	360.1	0.9	14	43.5	2201
BIS:105001991	6.5-8.5	-	75	30	300	-	250	0.3	150	45	500
WHO:2011	6.5-8.5	1.2	75	50	-	4	250	0.3	500	50	1200

Fig-3 Number and percentage of samples obtained in each range of CA HARDNESS, MG HARDNESS and TOTAL HARDNESS from each Meta regions

DISCUSSION: Calcium hardness in few water samples we have seen have to increase due to more industrial waste in ground water table of those areas and due to this total hardness of those areas will also increase and Magnesium hardness of this areas though increase in very less amount.
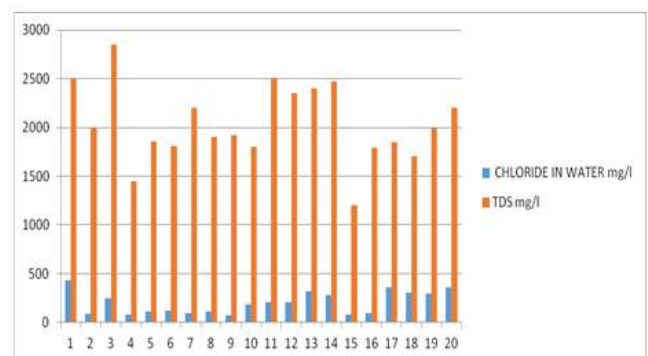
Fig-4 Number and percentage of samples obtained in each range of CHLORIDE IN WATER, TDS from each Meta regions

DISCUSSION: Chlorides in water increases when more salt is present in ground water table and due to industrial wastes in water found in those areas ground water table, so chlorides in few industrial areas have increased as seen and TDS is increased in few water samples have increased due to high correlation factors in those samples. Sometimes it is due to presence of inorganic compounds in their ground water beds.

Fig-2 Number and percentage of samples obtained in each range of PH, CONDUCTIVITY from each Meta regions

DISCUSSION: PH of few areas have come less due to present of carbon dioxide in water samples of those areas which is due to industrial waste water in their ground water beds and conductivity have come less in few water samples due to presence of very less ions of alkali, chlorides are found in their ground water beds.

Fig-5 Number and percentage of samples obtained in each range of SULPHATE, NITRATE from each Meta regions

DISCUSSION: Sulphates in few water samples have increased due to present of sulphur in ground water table due to industrial wastes in ground water and similarly Nitrates have also found high in those water samples where more industrial waste water flows.

Fig-6 Number and percentage of samples obtained in each range of DISSOLVED OXYGEN, IRON from each Meta regions

DISCUSSION: Dissolved oxygen in few water samples have come less due to low amount of oxygen present in those waters which is because of more impurities are found in those ground water table and Iron in few water samples have increased due to presence of more iron component in those ground water table.

Fig 7. Total no. of bore wells in Bangalore city

5. CONCLUSIONS

- The analysis of groundwater and the surface water samples from the Bangalore area has shown that almost 30% of the samples are unfit for drinking purpose.
- The analysed data clearly indicates that the groundwater is getting polluted at an alarming rate due to rapid industrialization.
- Most of the samples were found to be potable, yet a considerable percentage in all the meta divisions especially South-east showed a significant non-potability for each of the parameters.
- pH, as one of the quality assessment parameter, contributes to the occurrences of eye and gastrointestinal irritation leading to severe health concerns.
- Onset of cardio-vascular diseases as well as renal complications is enhanced by the presence of several inorganic and organic ions comprising TDS.
- Therefore, in order to reduce the propensity of morbidity, regular scrutinization and treatment of the contaminated drinking water such as use of neutralizer filter for pH, reverse osmosis, deionization, distillation, carbon filtering etc.
- Most importantly the awareness about occurrences of such deadly diseases in the end users are of profound importance.

- In addition to it, assigning a particular water quality index for ground water, e.g. Universal Water Quality Index (UWQI) developed for surface water quality assessment, will also help in representing the complex ground water quality data in a simpler way, which will facilitate an easier analysis, interpretation and further treatment measures.

- There are existing treatments and intense research works being organized all over the world to treat all such lethal diseases, predominantly, diarrheal complications occurring due to the consumption of enteric pathogen contaminated water, but are yet to be mastered from aspects such as availability, expensiveness in an epidemic setting.

- Hence; considering prevention as a better combating measures against these morbidities, it is strongly suggested to analyse and treat the drinking water at the point of use in a regular basis. From a social point of view, a better city foundation plan including proper water supply throughout the peripheral regions and better sanitary establishments will certainly complement the cause.

- Replacing of the damaged pipelines and lining of sewer drains is necessary to prevent the leakage of sewage in pipes and seepage through unlined channels and to prevent the mixing or leaking of sewage with groundwater.

- Water treatment facility shall be designed in order to provide potable water to the residents of the area. To meet the ever increasing need of Potable groundwater and surface water, the best way is to collecting the groundwater by protecting it from pollution and augmenting it with the groundwater resources by recharging it through rainwater harvesting.

- This study is carried out during pre-monsoon season. It was observed that the main causes of deterioration in water quality were high interference of anthropogenic activities, lack of proper sanitation, and industrial and domestic wastewater inflow. A specific management plan involving all stakeholders will help

improve and maintain the river water quality

6. RECOMMENDATIONS

From the present scenario it is quite evident that our dependency on surface/ground water is going to increase with every passing day. In the view of this growing demand and deterioration in the quality of ground water there is an urgent need to take up effective measures for conservation management and augmentation of ground/surface water resources. A comprehensive ground/surface water management plan involving ground/surface water scientists, city planners, land use exports, environmentalists and general public should be drawn.

The major list of the recommendations is presented below: -

- More observation station for water level and quality monitoring should be established.
- Setting of ground/surface water obstruction structures should be scientific.
- Proper care should be taken to keep it away from the influence of waste disposal sites.
- Artificial recharge schemes should be made popular; this can be done by popularizing roof tap rain water harvesting methods to achieving this building codes of the city may be suitably revised to make this mandatory for all new constructions.
- Disposal of municipal waste should be managed properly apart from proper treatment of sewage.
- Mass awareness programs to educate public should be arranged by different groups and through electronic media.

- Water Storage, Distillation and Recharging of Underground Aquifers.
- Water quality management needs to be taken up on priority basis.
- Rain harvesting is crucial for water and food security due to short time span of annual rainfall.
- River Basin Planning and Holistic Water Management.
- Inter-ministerial/inter-departmental co-ordination.

Developing Core Competence in Research and Facilitating Data availability

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Usage of Plastic in Manufacturing of Solid Bricks along with M-sand and Bitumen

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ABSTRACT

Plastic, one of the greatest materials invented by mankind. Since the development of plastic earlier this century, it has become a popular material used in different ways. They are cheap, durable and easy to make. In today's world, plastic is used to make or wrap many items, we buy or use. But the main problem arises when we no longer want those items and we have to discard them. As the production cost of plastic is very less, it is readily available in the market. The cheapness means plastic gets discarded easily, its long life means it doesn't decompose easily and requires high ultraviolet ray to break down. In the 21st century, one of the major environmental issues is arising due to the plastic waste. Plastic is non-biodegradable hence the discarded plastics are affecting our environment gravely. Due to the huge popularity of plastic as a production material, decrease in plastic usage policies isn't encouraged by manufacturing companies, rather it is estimated that the plastic usage rate going to be double for the next 10 years. As we are still looking for viable solutions to this plastic waste management problem, this study is solely focused on the recycling of discarded plastic bottles in building materials. The main purpose of this particular study is to introduce plastic waste in brick production and explore the performance of plastic bricks, made out of polyethylene terephthalate (PET) bottles and M-Sand. The bricks were casted with plastic to M-sand in different proportion and bitumen was used as a binder material. The experimental outcomes were compared with locally available clay bricks.

Keywords : Plastic Bricks, PET bottles, Bitumen, M-Sand, Compressive Strength, Water absorption.

I. INTRODUCTION

During the nineteenth century, the dawn of industrial revolution saw the development of many innovative materials and synthetic plastic is one of them. After World War I, typically in the time period 1950 to 1960, global plastic production had increased drastically from 2 billion tonnes to approximately 380 million tonnes in 2015. In the past 70 years, the world has seen a production of 8.3 billion plastic in which 6.3 billion tonnes have been discarded. Each year from those remaining wastes, a large number of plastic wastes are found in oceans. Due to their high durability, plastic does not decompose easily and takes up almost 450 to 1000 years in that process. India, a country whose plastic industry is growing rapidly, only 30% of the total disposed plastic is collected. The sources from The Energy and Resources Institute (TERI) suggested that the country produces approximately 26,000 tonnes of plastic waste daily. Furthermore, the source also anticipates that by 2020, the annual plastic consumption is going to increase from 12 million tonnes to 20 million tonnes.

Given this predicted growth in plastic production, The Energy and Resources Institute (TERI) also encouraged that there should be subsequent recycling for the plastic waste. This recycling policy of plastic will be a critical step towards the reduction in the generation of new plastic waste. But repeated recycling of plastic poses a grave threat of transforming plastic into a carcinogenic material. Also, the poor waste management system of Indian cities made the matter worse. In today's world, it is very much impractical to ban the plastic use completely. Rather than completely banning the plastic use, it is much more essential to manage the plastic waste systematically.

1.1 Recycling of Plastic Waste (PET) in Construction:

Plastic waste is increasing exponentially every year throughout the world. Both manufacturing and destruction of plastic pollute the air, water, and land. Currently, 10 to 15% of the plastic waste is recycled into road construction. Polyethylene terephthalate (PET) is a type of plastic resin, used in the production of plastic bottles and plastic containers for packaging food and beverages and other products. Although PET bottles can be recycled and reused, they hold a significant amount of bacterial contamination threat. The molecular composition of polyethylene terephthalate consists of ethylene molecules (-CH2-CH2-), ester molecule (-COO) and terephthalate ring. Basically, it is made out of hydrogen, carbon and oxygen atom. Hence the burning of PET only generates carbon dioxide (CO_2) and water (H_2O), which are not carcinogenic emissions.

1. Objectives

- ✓ To develop considerably light weighted bricks for the construction works.
- ✓ To develop and study the salient properties of bricks made from polyethylene terephthalate (PET) bottles.
- ✓ To reduce and reuse the plastic waste in a way that will improve the plastic waste management system.

2. Materials and It's Properties

Plastic Bottles (PET bottles):

For this experimental study, plastic bottles are collected from three main sources. Those are given below,

- ✓ Municipal- This source includes residential buildings, commercial establishments such as hotels, hospitals etc.
- ✓ Distribution and Industrial Sectors- This source comprises of food and chemical industries etc.
- ✓ Others- This source predominantly comprises of automotive waste, agricultural waste, and constructional debris

Table 1. Properties of Polyethylene Plastics

Properties of Polyethylene plastics (Results are collected from Central Institute of Plastic Engineering and Technology, Chennai, India)	
Density at 23oC	0.958
Elasticity modulus	9
Tensile creep strength	8
Bending creep modulus	1
Tensile strength at 23oC	2
Elongation at break (%)	>600
Thermal conductivity	0
Ignition temperature	3

Fig 1. Collection of PET bottles

Bitumen

Bitumen is a binder material, usually present in either viscous liquid form or solid form. It consists of hydrocarbons and their derivatives, possess waterproofing and adhesive properties. The following results are obtained from bitumen testing.

Table 2. Properties of Bitumen

Properties of Used Bitumen		
Tests on Bitumen	Results	Values
Ductility Test	Ductility Value of Bitumen	72
Flash & Fire Point Test	Flash Point of Bitumen	315OC
	Fire Point of Bitumen	340OC
Softening Point Test	Softening Point of Bitumen	45OC
Penetration Test	Solid Cone Penetration Value	87.34 mm
	Hollow Cone Penetration Value	83.34 mm
	Solid Needle Penetration Value	228.34 mm

M-Sand:

Manufactured sand also known by the name of M-Sand is an alternative to river sand in the construction field. It is produced from the granite rocks by crushing them. M-Sand usually consists of silica, aluminium dioxide, ferric oxide and magnesium oxide. So for this particular experiment, M-Sand is selected as fine aggregate and has a specific gravity of 2.72. The coefficient of curvature (CC) and uniformity (D60/D10) of the M-Sand is 1.125 and 4.5 respectively, which indicates that the used M-Sand is well graded in nature.

1. Proportioning of Materials and Mixing Process

Proportioning of Materials

Initially, with the help of trial and error method, the total amount of required material for a brick is selected as 3.5 kg. Later, the material proportioning is done to the weight of the brick material. The material proportion table is given below.

Table 3. Material Proportioning (Quantity of Materials)

Designation of Mix	Plastic		Bitumen		M-Sand	
	In percentage	In grams	In percentage	In grams	In percentage	In grams
Mix1	50	1750	2	70	48	1680
Mix2	60	2100	2	70	38	1330
Mix3	70	2450	2	70	28	980
Mix4	80	2800	2	70	18	630

ii. Mixing of Materials

In the beginning, a specific amount of plastic bottles were melted in a vessel at high temperature. Due to this high temperature, the plastic changed its phase from solid to liquid. As the temperature rises, the viscosity of plastic reduces drastically. At the melting point, when all of the plastic inside the vessel melted into liquid form, the required amount of bitumen and M-Sand were added to the liquid solution of plastic. Following the addition of bitumen and M-Sand, the solution is mixed throughout to prepare the absolute mix.

Fig 2. Melting of PET bottles

Fig 3. Mixing of M-Sand and Bitumen

2. Preparation of Mould, Casting and Drying

Rectangular moulds of dimension 20 cm X 10 cm X 10 cm were prepared. After obtaining the absolute molten mix, the molten mix then poured into the hollow moulds and left to dry for 24 hours. The de-moulding of bricks was done after 24 hours. The removed bricks then kept for further drying periods of 7 and 28 days. After attaining the drying period, the compressive strength test and water absorption test were carried out on the samples.

Fig 5. Mould of dimension (20 X 20 X 20) cm

Fig 6. Dried Plastic Brick

Tests and Results

Compressive Strength Test

Compressive strength is the resistance of any material to break under a compressive load and tested with the help of compression testing machine. For this test, the used compression testing machine had a capacity of 2000 kN and loaded at a constant rate of loading at 200kg/cm²/min as per Indian standard procedure. Total five number bricks from each of the different mix proportions are tested. The maximum compressive loads and any unusual failure of test samples are recorded. From the compressive loads, the compressive strength value is calculated with help of the following formula

Compressive Strength = (Maximum Load / Cross Sectional Area)

Table 4. 7 Days Compressive Strength of Bricks

Designation of Mix	Days	Amount of Plastic Used (%)	Amount of M-Sand Used (%)	Compressive Loads (kN)	Compressive Strength (N/mm²)
Mix$_1$	7	50	48	155	7.75
Mix$_2$	7	60	38	98	4.9
Mix$_3$	7	70	28	85.1	4.25
Mix$_4$	7	80	18	51	2.25
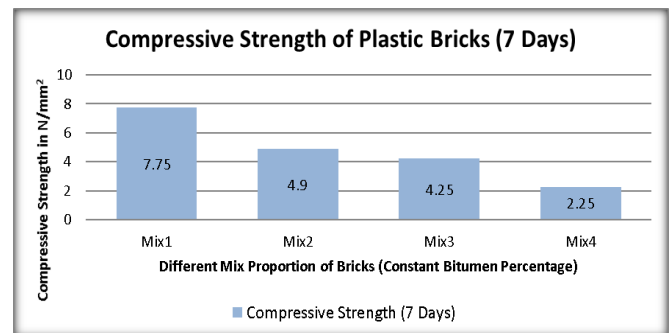
Table 5. 24 Days Compressive Strength of Bricks

Designation of Mix	Days	Amount of Plastic Used (%)	Amount of M-Sand Used (%)	Compressive Loads (kN)	Compressive Strength (N/mm^2)
Mix$_1$	28	50	48	159	7.96
Mix$_2$	28	60	38	105	5.25
Mix$_3$	28	70	28	87	4.35
Mix$_4$	28	80	18	53	2.65

Chart 2. 28 Days Compressive Strength of Bricks

$$Water\ Absorption = [(W2 - W1) / W1] \times 100$$

Mix Designations	Plastic Bricks			Conventional Clay Bricks		
	Dry Weight of Bricks (W1) kg	Weight of Bricks after 24 hours in the water (W2) kg	Water Absorption in %	Dry Weight of Bricks (W$_1$) kg	Weight of Bricks after 24 hours in the water (W$_2$) kg	Water Absorption in %
Mix1	2.95	2.95	Nil			
Mix2	2.72	2.72	Nil	3.14	3.65	16.24%
Mix3	2.325	2.325	Nil			
Mix4	2.17	2.17	Nil			
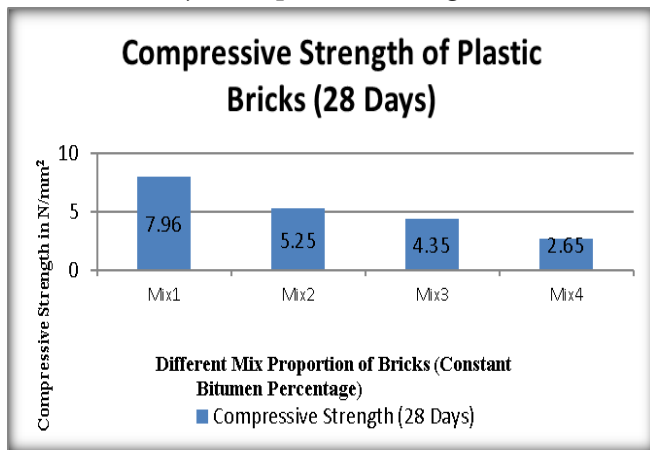
Water Absorption

Water absorption test is conducted to check the durability property (such as degree of burning, quality and behaviour under weathering action etc.) of the bricks (IS: 3495, Part-II). The dried bricks with different mix proportion were subjected to the water absorption test. Initially, the weight of the dry brick samples was recorded as W1. Then the samples were immersed in the clean water at a temperature (27+2)OC for 24 hours. Finally the samples were taken out of the water, subsequently wiped clean with damp cloths to remove the surface water. The final weight of brick samples was then recorded as W2. The percentage of water absorption (by mass) of the brick samples was calculated with the following formula.

Conclusions

Even before obtaining any of the experimental outcomes, we can easily pronounce that the overall idea of producing plastic bricks is an environment-friendly decision. Not only will it be an eco-friendly material but it will also be an economical building material and will offer a great plastic waste management solution.

Though plastic brick has some great benefits but to be used as a building material it has to qualify some important structural properties. Now, based on the experimental investigations carried out on bricks made out of plastic, M-Sand, and bitumen, the following inferences are drawn.

✓ As the plastic percentage in a brick increases, the weight of the brick significantly reduces. This eventually will have a positive impact on

transportation cost. The average weight of conventional clay brick is 3.5 kg, whereas bricks made out of plastic percentages 50, 60, 70, 80 have average weights as 2.95 kg, 2.72 kg, 2.325 kg and 2.17 kg respectively.

✓ In case of both 7 and 28 days, the highest compressive strength is noticed in the bricks with 50% of plastic and 48% of M-Sand. As the plastic percentage increases, the bricks lose its compressive strength drastically.

✓ From the water absorption test, it is observed that the water absorption is nil for all of the different mix proportions. This indicates that these bricks are more susceptible and durable in nature.

Henceforth, it can be concluded that bricks made out of PET bottles, M-Sand and bitumen is eco-friendly and lightweight in nature. Furthermore, with enhanced compressive strength and reduced weight and water absorption, these bricks already have some superior results when compared to the conventional clay bricks

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Effect of Replacement of Cement by Fly Ash and Metakaolin on Strength Properties of Concrete

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ABSTRACT

An experimental investigation was carried out to understand the effects of partial replacement of cement by fly ash and metakaolin of M50 grade concrete mix. A control specimen was prepared by using OPC 43 grade cement. Improvement in compressive strength and split tensile strength was observed with the replacement of cement by 15% fly ash and metakaolin at 5%, 10%, 15% and 20%. An increase of up to 35.8 % in compressive strength and up to 51.5% split tensile strength was observed.

Keywords : Cement concrete, Metakaolin, Fly ash, Compressive Strength, Split tensile strength.

I. INTRODUCTION

With the development of technology and increased consumption of concrete, betterment of characteristics such as strength, workability, durability of conventional concrete is essential to make it more suitable for various situations.

Fly ash, Metakaolin, Rice husk ash, Silica fume etc used as alternative cementitious ingredients of concrete which are known to enhance the strength properties and make the conventional concrete more suitable under different circumstances and also cost effective.

Use of these alternative materials is also eco-friendly as it reduces emission of CO2.

Also, enhancement in the strength and durability characteristics is one of the important significance of adding fly ash. It is observed from the previous experimental results available in literature that, blending metakaolin with Portland cement improves the properties of concrete by increasing compressive and flexural strength, preventing alkali silica reaction, reducing efflorescence and shrinkage preventing corrosion of steel.

II. METHODS AND MATERIAL

A. Materials

- **Water:** Drinking water was used for the experimental study
- **Cement: cement conforming to IS, OPC of grade 43.** Test results obtained are given in Table 1.
- **Fine aggregates:** River sand with fineness modulus 2.97 conforming to zone II was used. Test results obtained are given in Table 1.
- **Coarse aggregates: aggregates of c**rushed granite with fineness modulus 6.9 (20 mm down size) was used for the experimental study and the results for the tests carried out are presented in table 1
- **Fly ash: F**ly ash with the results tabulated in table 1 used for the study.

- **Metakaolin:** The specific gravity of metakaolin was evaluated from the experimental study. The results have been tabulated in table 1.

Table 1: Specific gravity of materials used

Materials	Specific gravity
Cement	3.14
Fine aggregates	2.60
Coarse aggregates	2.68
Fly ash	2.18
Metakaolin	2.38

Table 2: Mineral Composition of metakaolin

Major Minerals	Percentage (%)
Lime (Cao)	1.1
Silica (SiO$_2$)	53.2
Alumina (Al$_2$O$_3$)	43.0
Iron oxide (Fe$_2$O$_3$)	0.98
Magnesium oxide (MgO)	0.08
Sodium oxide (Na$_2$O)	0.035

B. Mix Proportion

M30 grade of concrete was used. The mix proportion was evaluated confirming to the IS 10262-2009. The various mix proportions for nominal concrete (Control specimen) and fly ash based metakaolin concrete are presented in Table 3.

Table 3 : Mix proportion

Mix Proportion	Cement (Kg/m³)	Metakaolin (MK) (Kg/m³)	Fly ash (Kg/m³)	Fine Aggregate (Kg/m³)	Coarse Aggregate (Kg/m³)	W/C
Control specimen	450	......	......	865	970	0.4
MK 5% Fly ash 15%	360	22.5	67.5	865	970	0.4
MK 10% Fly ash 15%	337.5	45	67.5	865	970	0.4
MK 15% Fly ash 15%	315	67.5	67.5	865	970	0.4
MK 20% Fly ash 15%	292.5	90	67.5	865	970	0.4

C. Testing of specimen

Standard sized cubes (150 mm X 150 mm) and cylinders (150 mm diameter and 300 mm length) were tested for compressive strength and split tensile strength.

- **Compressive strength**
  Nine cubes were cast for each mix and tested at the age of 3, 7 and 28 days under 200T capacity Compression Testing Machine
- **Split Tensile strength**
  Nine cylinders were cast and tested at the age of 28 days under 200T capacity Compression Testing Machine

III. RESULTS AND DISCUSSION

- **Compressive strength:** Strength values are shown in Table 4 and are also depicted graphically in figure 1

Table 4. Results-Compressive strength

Mix	Compressive strength (N/mm²)		
	3 days	7 days	28 days
Control specimen	23.75	34.5	58.2
MK 5% Fly ash 15%	24.9	38.75	61
MK 10% Fly ash 15%	28.2	46.5	68.2
MK 15% Fly ash 15%	32.2	51	74.2
MK 20% Fly ash 15%	33.75	55.8	79

- **Split Tensile strength**

The split tensile strength was determined after normal curing of specimens for 28 days and the same are tabulated in Table 5.

Table 5. Results- Split tensile test

Mix	Split Tensile Strength (N/mm²)
Control specimen	2.85
MK 5% Fly ash 15%	3.11
MK 10% Fly ash 15%	3.58
MK 15% Fly ash 15%`	4.12
MK 20% Fly ash 15%	4.32

A considerable increase in the strength was observed from the results (Table 4 and 5).
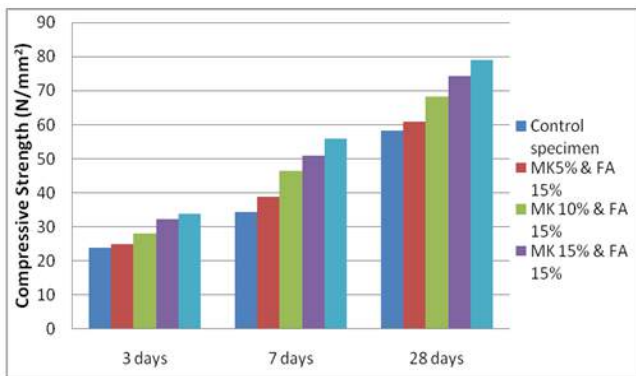
Fig. 1 Variation in Compressive Strength

IV. Conclusions

It can be concluded from the results that,

1. Metakaolin and flyash contributed to enhancement early strength and ultimate strength of concrete.

2. Use of metakaolin and flyash and their lesser cost affects in cheaper economy

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An Experimental Study of Flexural Behavior of Bubble Deck Slab

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ABSTRACT

Reinforced concrete slabs are one of the most common components in modern building construction. Reinforced concrete slabs with plastic voids are a new and innovative type of structural concrete slab system developed to allow for lighter self-weight of the structure while maintaining similar load carrying capacity of a solid slab. Plastic voided slabs are capable of reducing the amount of concrete necessary to construct a building by 30 percent or more. This reduction can be beneficial in terms of financial savings as well as building performance.

This report examines a flexural capacity of two-way reinforced concrete slab with spherical voids in comparison to conventional reinforced concrete slab. The conventional reinforced concrete slab is designed as per the Code provision of IS: 456-2000. For the same depth of slab, 35mm and 40mm diameter spherical voids are created at different spacing at the center of the slab to create voided slab. The slabs are analyzed for different loading and boundary conditions. The geometry of all the slabs was constant 1000x1000x70 mm. The slabs are subjected to nine point bending load/UDL.

Keywords : Bubble Deck Slab(BDS), RC Conventional Slab.

I. INTRODUCTION

In the 1990's, Jorgen Breuning invented a way to link air space and steel within voided biaxial concrete slab. The BubbleDeck technology uses spheres made of recycled industrial plastics to create air voids while providing strength through arch action. As a result, this allows the hollow slab to act as normal monolithic two-way spanning concrete slab. These bubbles can decrease the dead weight up to 35% and can increase the capacity by almost 100% with the same thickness compared to conventional solid slad having same geometry. As a result, BubbleDeck slabs can be lighter, stronger, and thinner than regular conventional reinforced concrete slabs.

Bubble Deck is a revolutionary biaxial concrete floor system developed in Europe. High density polyethylene hollow spheres replace the ineffective concrete in the centre of the slab, thus decreasing the dead weight and increasing the efficiency of the floor. These biaxial slabs have many advantages over a conventional solid concrete slab: lower total cost, reduced material usage, enhanced structural efficiency, decreased construction time, and is a green technology.

Objective and scope

Objective

Objectives of the present investigation are to:

- To obtain the scaled down prototype dimensions of the slab that is to be casted in the laboratory to simulate 9m x 9m x 0.40m slab
- To study the flexural behaviour of two-way Bubble Deck slab of M25 grade of concrete and mild steel reinforcement by varying the percentage of reinforcement at bottom, top and middle layer of slab.
- The bubble deck slabs are comparing with conventional solid concrete slab.

Scope of the study

The experimental studies are carried out to understand the flexural behaviour of two-way Bubble Deck slab. To simulate the 9m x 9m x 0.40m bubble deck slab behavior in the lab, scaled down model of 1m x 1m x 0.07m slab with the scaling factor of 1:7.74 is casted in the laboratory. Flexural tests are carried out on the scaled down slabs for percentage of reduction in concrete volume by 12.28% with the minimum reinforcement of 0.15% of total cross-sectional area cured for a period of 28 days. The test results are compared with conventional solid concrete slab of same dimension.

Methodology

The research methodology is to conduct a literature review of the studies on solid slab and bubble deck slab that have been conducted. On the basis of the literature review, it is realized that the flexural properties of the solid slab and bubble deck slab have been studied by many researchers in different areas of world and still studying; however there still a need to provide experimental and knowledge ground for the use of bubble deck slab in various field. An experimental program was developed to study the flexural properties of bubble deck slab in hardened state. The experimental program included the comparison of ultimate load carrying capacity, deflection and strain between the solid conventional slab and bubble deck slab. Using concrete mixes, test specimens were cast, cured and tested as per the experimental matrix.

Parameters

Figures and Tables
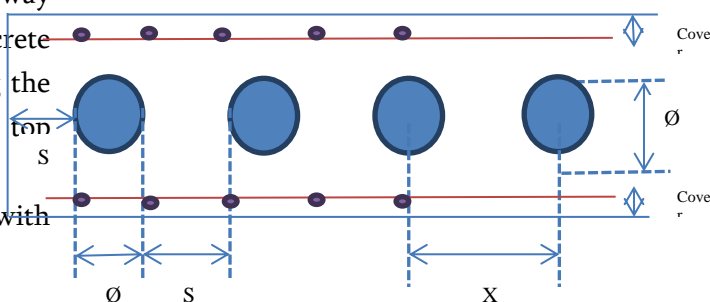
Figure 1 Typical cross section of slab with top and

Middle layer reinforcement spacing

Figure 2 Typical cross section of slab with top, bottom and middle layer reinforcement placed in between balls for all bubble deck slabs

Table 1 Details of Specimen

S N	Slab Specimen/D esignation (bottom + middle + top) Reinforcem ent	% Volu me reduct ion in concre te	No. of plasti c balls	Reinforcement		
				Botto m	Mid dle	Top
1	S₀ (R C Convention al Slab)	0	0	2.6m m@2 6mm c/c	-	2.6mm @ 52mm c/c
2	S₁	12.28	256	2.6m	-	-

	(Ast +0 +0)			m@2 6mm c/c		
3	S₂ (Ast +0+ Nominal Ast)	12.28	256	2.6m m@2 6mm c/c	-	2.6mm @ 52mm c/c
4	S₃ (Ast + ¼ Ast + Nominal Ast)	12.28	256	2.6m m@2 6mm c/c	2.6 @ 100 mm c/c	2.6mm @ 52mm c/c
5	S₄ (¾ Ast +1/4 Ast +Nominal Ast)	12.28	256	2.6m m @ 34m m c/c	2.6 @ 100 mm c/c	2.6mm @ 52mm c/c
6	S₅ (½ Ast 1/2 Ast +Nominal Ast+)	12.28	256	2.6m m @ 52m m c/c	2.6 mm @ 52m m c/c	2.6mm @ 52mm c/c
7	S₆ (½ Ast + 0+1/2 Ast)	12.28	256	2.6m m @ 52m m c/c	-	2.6mm @ 52mm c/c

Following parameters are considered for the study:

Constant parameters:

- Size of the specimen: 1000mm x 1000mm (925mm effective span) and 70mm (depth)
- Type of the loading: Nine-point load applied at the centre of the slab. The concentrated load from the hydraulic jack is distributed over the nine-steel balls placed over an area of 320mm x 320mm.
- Support conditions: Simply supported on all the four edges of the slab
- Grade of concrete: M25
- Grade of steel: Mild steel bars of 2.6mm diameter
- Plastic balls: 40mm diameter balls
- Spacing of balls: 20mm from edge to edge
- Curing period: 28 days

Variable parameters:

- Varying percentage of Reinforcement.

Results and Discussions
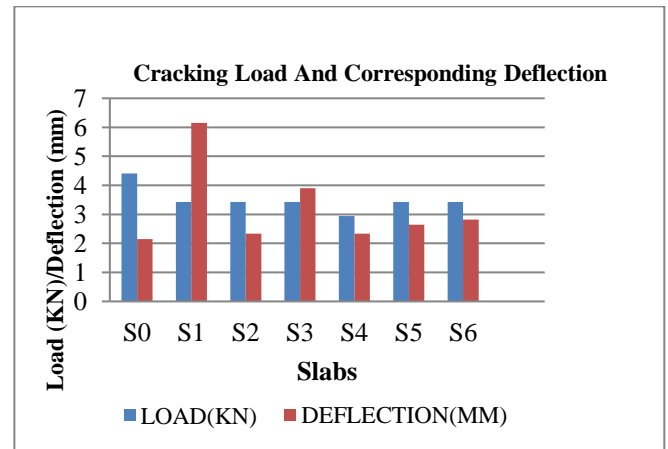
Chart 1 Cracking Load and Corresponding Deflection

It is observed that the first crack appeared on the solid slab (S0) for an applied load of 4.41kN. In Bubble Deck slabs the first crack appeared at 3.43kN (which is 22% less than the RC slab).irrespective of the position of reinforcement

The slab S1 with reinforcement only at bottom layer, Bubble Deck slabs shows more deflection than RC slab by 65%. With reinforcement at the middle layer of the slab, S3, S4 and S5 have shown the deflection of 3.90mm, 2.33mm and 2.64mm respectively at the appearance of first crack. Bubble deck slab without reinforcement at the middle layer of the slab S1, S2 and S6 have shown deflection of 6.15mm, 2.34mm and 2.82mm respectively. However the deflection in the bubble deck slabs is higher than the RC slab this may due to the presence of plastic balls which is making Bubble Deck slab to behave like a spatial structure and forces are getting distributed within the slab in a better way, in turn increasing the slab strength. Bubble deck slabs with bottom and top reinforcement, with and without middle layer reinforcement deflected by 44% higher than the RC slab.
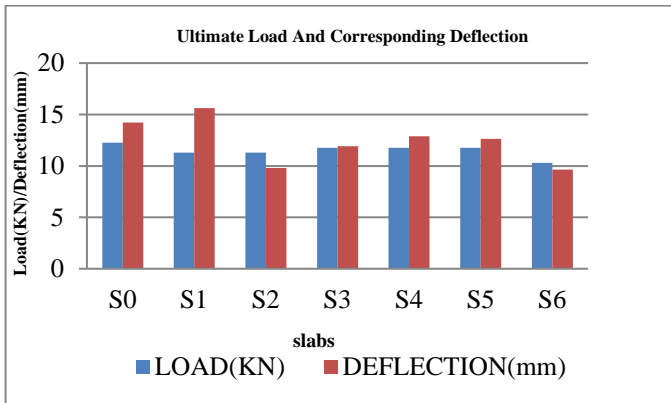
Chart 2 Ultimate Load And Corresponding Deflection

It is observed that ultimate load of RC conventional slab (S0) is 12.74kN, and the ultimate load of the bubble deck slabs is 4% to 8% less when compared with a RC conventional slab (except S6 slab which 16% less).

The ultimate load of Bubble Deck slabs with middle layer of reinforcement i.e. S1, S2 and S6 is 11.72KN, 11.72KN and 10.70KN respectively. The ultimate load of Bubble Deck slabs without middle layer of reinforcement i.e. S3, S4 and S5 is 12.23KN for all slabs. From this result an inference can be drawn that the presence of middle layer of reinforcement in bubble deck slabs resist more load. The maximum deflection of RC conventional slab (S0) is 14.23mm. Table 5.25, bubble deck slabs (S1) with only bottom layer reinforcement deflect more than the RC conventional slab by 8.8%. Bubble Deck slabs with reinforcement at bottom, top and middle layer S3, S4, and S5 deflects less than RC slab varying between 9.8 to 16%.the bubble deck slab with bottom and top reinforcement deflects by 31% less than the RC slab.

Based on the above result it is found that the bubble deck slab with reinforcement at bottom, top and middle layer of reinforcement deflects almost same as RC conventional slab. The bubble deck slab with only bottom reinforcement carries more load and deflects more.

This behavior might be due to Bubble Deck slab capable of taking service loads more than RC conventional slab, and forces getting distributed within the slab in a better way due to the presence of plastic balls at the centre of the slab. The above results indicate that insertion of plastic balls in the centre of the slab has nearly same load carrying capacity as that of RC conventional slab.do not affects the strength of the slab, this may be due to the action of the plastic balls as spatial structure.

Conclusion

The conclusions pertaining to comparison of flexural behavior of Bubble Deck slab are listed below.

• The flexural behavior of the Bubble Deck slab is considerably good in comparison to the Conventional RC Slab.

• In the present study by introducing voids into the RC conventional slab, the self-weight of the slabs can be reduced up to 10.91% and it is concluded that voided slab can be used to reduce the structure weight with minimal impact to the overall building design and also greatly reduce the overall weight of the slab while meeting load capacity requirements.

• Bubble deck slabs have shown reduced noise levels in comparison with RC conventional slab. The slab (S1) has shown a better result with 2.14% of noise reduction

• Bubble deck slabs have shown reduction in volume up to 12.28% when compared with conventional RC slab resulting in reduction in dead load of the slabs.

• First crack load of all bubble deck slabs irrespective of reinforcement remains same, 22.22% less than the first crack load of RC conventional slab.

• The deflection at first crack of bubble deck slab were remains same and 15% higher than deflection of RC conventional slab, however slab (S1) which is nearly 65% more deflection than RC conventional slab.

• The ultimate load of all bubble deck slabs shown almost same as RC conventional slab. The ultimate load of bubble deck slabs 4% less than RC conventional slab and the deflection at the

ultimate load of all bubble deck slabs 32.32% lesser than the RC conventional slab except slab (S1) which is 8.84% more deflection than the RC conventional slab.

- The ultimate load of bubble deck slab with bottom and top reinforcement and without middle reinforcement 8% less than the RC conventional slab except (S6). Whereas bubble deck slab with bottom, middle and top reinforcement is 4% less than the RC conventional slab. The deflection at ultimate load with only bottom reinforcement is 8.84% higher than the RC conventional slab. The deflection of bubble deck slab with bottom, middle and top reinforcement is 10% less than the RC conventional slab.

- RC conventional slab is rigid along the yield line and flexible at the center and along the X-line. Whereas bubble deck slab with only bottom reinforcement and bottom and top reinforcement are flexible along the centre, yield line and X-line. The bubble deck slab with bottom, middle and top reinforcement are rigid along the yield line similar to RC conventional slab, however the rigidity is less than the RC conventional slab.

- Off all bubble deck slab with different position of reinforcement S2 slab with designed reinforcement at bottom and nominal reinforcement at top resist only 4% less load than RC conventional slab and deflection is 31% less than RC conventional slab. And it is flexible at the centre, along the X-line and along the yield line.

- Slabs with bottom, middle and top layer reinforcement behaves similar to RC conventional slab with 4% less load carrying capacity and 9.5% less deflection and the flexibility of slab is little higher than the RC conventional slab.

- S6 slab with designed reinforcement distributed half at bottom and top shows least performance having 16% less and 32% less deflection and it is very rigid.

- Bubble deck slab with only bottom

reinforcement has the load carrying capacity nearer to RC conventional slab with 8% variation and with higher deflection 8% greater than the RC slab it is flexible along the yield line controversial to RC conventional slab.

- Bubble deck slab (S1) with having only bottom reinforcement which shows the better load carrying capacity compared to RC conventional slab. And it is 22.22% less at cracking load and ultimate load when compared to RC conventional slab.

- Bubble deck slab (S1) having only bottom reinforcement deflection at cracking load and ultimate load is 65% and 8.84% more than the RC conventional slab. This indicates that the bubble deck slab (S1) is more flexible because of only bottom reinforcement.

- This behaviour might be due to the presence of tension reinforcement (Ast) and compression reinforcement(nominal reinforcement) which is making Bubble deck slab to behave like a spatial structure and forces are getting distributed within the slab in a better way

- Structural design and detailing of bubble deck slab is straight forward.

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Partially Replacement of Cement by Waste Glass Powder in Concrete

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ABSTRACT

Storage and safe disposal of waste glass is a huge problem for municipalities everywhere. Reuse of waste glass eliminates/reduces this problem. In this experimental work, the effect of partially replacing cement in concrete by glass powder is studied. The cement in concrete is replaced by waste glass powder in steps of 5% from 0%, 5%,10%,15%,20% by volume and its effects on compressive strength and flexural strength are determined. It is found that the compressive strength of concrete increase initially as the replacement percentage of cement by glass powder increases, become maximum at about 15% and later decrease.

Keywords : Concrete, Glass powder, Compressive strength, Flexural strength

I. INTRODUCTION

Concrete is one of the world's most used construction material due to its versatility, durability and economy. India uses about 7.3 million cubic meters of ready-mixed concrete each year. It finds application in highways, streets, bridges, high rise buildings, dams etc. Greenhouse gas like co2 leads to global warming and it contributes to about 65% of global warming. The global cement industry emits about 7% of greenhouse gas to the atmosphere. To reduce this environmental impact alternative binders are introduced to make concrete. Glass is an amorphous material with high silica content making it potentially pozzolanic when particle size is less than 75μm. The main problem in using crushed glass as aggregate in port land cement concrete are expansion and cracking caused by the glass aggregate due to alkali silica reaction. Due to its silica content ground glass is considered a pozzolanic material and as such can exhibit properties similar to other pozzolanic material. In this study, finely powdered waste glasses are used as a partial replacement of cement in concrete and compared it with conventional concrete. Concrete mixtures were prepared with different proportions of glass powder ranging from 0% to 20% with an increment of 5% and tested for compressive strength after 7 and 28 days of curing.

Objective and scope

Objective

Experiments were conducted on concrete prepared by partial replacement of cement by waste glass powder of particle size 600 micron and downwards. The main objective of this investigation was to evaluate the effect of waste glass powder on the compressive strength and the other properties of concrete and to evaluate the possibility of using glass powder in concrete without sacrificing the strength. The following were also considered.

- Partial substitute for the ordinary port land cement.
- The objective to study the effect of the use of glass powder as a replacement of cement to

know the percentage of glass powder can replaced in concrete.

- To determine the percentage of glass powder which gives maximum strength when compared to control concrete
- To evaluate the utility of glass powder as a partial replacement of cement in concrete.
- To study and compare the performance conventional concrete and glass powder concrete.
- To study fresh and hardened properties of concrete mixes replacing 10%, 20%,30%,40% of cement by glass powder.

Scope of the study

This scope of study is part of comprehensive program where in experimental investigations have been carried out to evaluate the effect of partially replacement of cement by waste glass powder on compressive strength 7 and 28 days. M25 grade of concrete was considered for experimental study with specimens prepared along with partially replacement of cement by waste glass powder.

Methodology
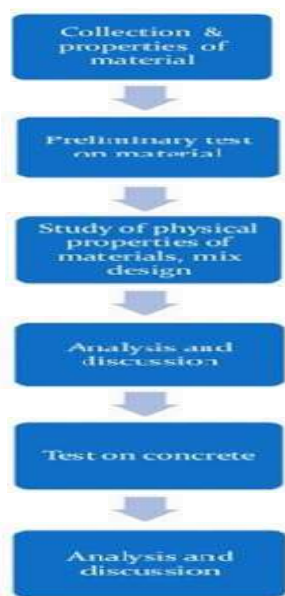
Chart 1:Flow Chart

Materials

Cement:

The cement used in this study was 53 grade ordinary port land cement (OPC) confirming to IS: 269-2015 as a basic ingredient of concrete. Compressive achieved by the cement at end of the 28th day should not be less than 53mpa or 53 kg/mm3 the color of cement will be grey.

The BIRLA 53 grade brand cement available in the local area in local market was used for investigations. Care should be taken to see the procurement was made from single batching in air tight containers to prevent it.

Table 1 : Physical properties of cement

Sl. No.	Test Conducted	Results	Requirements as per IS: 269-2015
1	Brand of cement	BIRLA SUPER	-
2	Type of cement *	OPC 53 Grade	-
3	Consistency	28.5%	Not specified
4	Initial setting time	130 Minutes	Shall not be less than 30 Minutes
5	Final setting time	235 Minutes	Shall not be more than 600 Minutes
6	Finesse of cement	7.6%	Shall not be more than 10%

FINE AGGREGATE:

Fine aggregate: sand is available of river for construction purposes sand the crushed sand is of cubical shape with grounded edges, washed and graded to as a construction material. The size of sand (River Sand) is less than 4.75mm. Locally available clean, well graded River sand was used as fine aggregate. The properties of the fine aggregate are represents the particle size distribution curve of the river- sand.

The aggregate was tested for its physical characteristics such as gradation, fineness modulus, specific gravity, moisture content, bulk density, water absorption in accordance with IS :383-2016

Table 2 : Characteristics of River-Sand

CHARACTERISTICS OF FINE AGGREGATE (CRUSHED STONE SAND)		
1.	a) Dry rodded bulk density	1805kg/m³
	b) Loose bulk density	1686 kg/ m³
2.	Specific gravity	2.57
3.	Water absorption	4.0 %
4.	Material finer than 75 microns	9.8 %
5.	Sieve Analysis	

IS Sieve Designation	Cumulative Percentage Retained	Passing	Specification as per IS:383-2016 (Percentage Passing)		
			Zone I	Zone II	Zone III
4.75 mm	0.7	99.3	90-100	90-100	90-100
2.36 mm	9.4	90.6	60-95	75-100	85-100
1.18 mm	23.2	76.8	30-70	55-90	75-100
600 µm	55.8	44.2	15-34	35-59	60-79
300 µm	71.6	28.4	5-20	8-30	12-40
150 µm	84.9	15.1	0-10	0-10	0-10

REMARKS: 1). The sample supplied satisfies the requirements of grading Zone II as per IS:383-2016. According to IS: 383-2016 for Crushed Stone Sands, the permissible limit on 150 micron IS Sieve is increased to 20%. This does not affect the 5% allowance permitted in Cl. 4.3

2). As per Table 1, Sl. No. 3 of IS: 383 – 2016), for Crushed stone sands, the Material finer than 75 microns IS sieve is Maximum 15% by weight.

Coarse Aggregate:

Coarse aggregate used was 20MM and down size and specific gravity. Testing was done as per Indian standard specification IS: 383-2016. Crushed aggregate of 20mm and 12.5mm size produced from local crushing plants were used. The aggregate passing through 20mm sieve size and retained on 6.3mm sieve is selected. The aggregate were tested for characteristics or physical requirements such as fineness modulus, water abruption, specific gravity and bulk density and dry density , moisture content accordance with IS 383-2016.

Table 3: Properties of course aggregate

SL NO	Properties	Values obtained
1	Specific gravity	2.67
2	Fines modulus	3.59

GLASS POWDER

Waste glass available locally was collected and made into glass powder the specific gravity of 2.54 less than 90microns. Glass is a transparent material produced by melting a mixture of materials such as silica, soda ash, and caco3 at high temperature followed by cooling during which solidification occurs without crystallization. Glass is widely used in our lives through manufactured products such as sheet glass, bottles, glassware, and vacuum tubing. The amount of waste glass is gradually increased over the recent years due to an ever-growing use of glass products. Most waste glasses have been dumped into landfill sites. The land filling of waste glasses is undesirable because they are not biodegradable, which makes them environmentally less friendly. So we use the waste glass in concrete to become the construction economical as well as eco-friendly. Composition of cement and glass powder is as shown in table 4

Table 4 : Chemical properties of cement and glass powder

Properties	Waste glass powder	Cement
SiO_2 (%)	70.22	23.71
CaO (%)	11.13	57.27
MgO (%)	-	3.85
Al_2O_3 (%)	1.64	4.51
Fe_2O_3 (%)	0.52	4.83
SO_3 (%)	-	2.73
Na_2O (%)	15.29	-
K_2O (%)	-	0.37
Cl (%)	-	0.0068
Loss on ignition (%)	0.80`	7.24

CONCRETE MIX DESIGN

The mix design is the practice of selecting appropriate constituents of concrete like cement, Fine aggregate, glass powder and coarse aggregate and water to optimize their relative proportion to meet the requirements of design. that is, it complies with the specification of structural strength required, the durability requirement in the

environmental in which it is used which also meets the workability requirements. That is it should be capable of being mixed, transported and compacted sufficiently and efficiently as possible and be economical without sacrificing the above requirement.

Table 5 : Mix proportion after adding glass powder

GLASS POWDER IN %	Cement (kg/m3)	Fine aggregate (kg/m3)	Coarse aggregate (kg/m3	Water content (kg/m3)	Mix proportion
0	340	750.95	1156.71	170	1 : 2.2 : 3.4
5	323	704.12	1193.54	170	1 : 2.7 :3.6
10	306	747.76	1160.83	170	1 : 2.44 : 3.7
15	289	851.06	1189.33	170	1 : 2.94 : 4.11
20	272	910.2	1420.08	170	1 : 3.35:5.2
30	238	919.6	1416.56	170	1 : 3.86:5.9
40	204	760.16	1144.3	170	1 : 3.9 : 4.8

Results and Discussions

The compressive strength of concrete with varying content of Glass powder at different ages, shown in Table 6 at 7 and 28 days, the strength generally decreases with glass powder content at 20%. The reduction in strength was observed for concrete with 20% of glass powder. And we can use glass powder upto 15% for construction purpose and its give good workability and strength compare to conventional concrete.

Table 5 : Compressive Strength

Sl No	% of Glass powder replacement	7 days compressive strength N/mm^2	28 days compressive strength N/mm^2
1	0	19.32	31.20
2	5	20.70	32.44
3	10	23.14	36.33
4	15	24	39.93
5	20	16.10	21.23

Concrete sample (Beam at 500*100*100*mm) of 7 days were tested for its flexural strength having different percentage of mixture of glass powder as replacement of cement. The level of replacement of Cement by mixture of Glass powder was 0%,5%,10%,15%, &20%. Ten sample of beam were

tested by using universal testing machine and the average strength of these two beam were taken and final results represented in table 6

Table 6 : Flexural strength

Sl No	% of Glass powder	7 days Flexural Strength In N/mm^2	28 Days Flexural Strength in N/mm^2
2	0	5.6	6.6
2	5	5.7	6.9
3	10	6.42	7.15
4	15	6.5	7.4
5	20	4.8	5.1

Conclusion

- When used as additional supplementary cementitious material at 15% level, glass powder can be obviously reduces the porosity and the pore size distribution. Thus large increase in compressive strength, resistance to water and chloride penetration were observed.
- Its increasing 22% of compressive strength compare to conventional concrete
- It can used in rigid pavement construction
- It gives better fire resistance compare to conventional concrete
- An optimum cement replacement of 15% of glass powder was observed with respect to development of compressive strength of concrete after 7, 28 days.
- The additional of recycle green building material such as glass powder can increase the slump of concrete, but an excessive addition may result in surplus mixing water that could result in slight segregation that can reduce the overall strength
- Generally considered the similar performance with replaced material glass powder addition can reduce significant cost of cement production and co2 emission and save the environmental by reducing greenhouse gas and particulate production.

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Nonlinear explicit analyses of RC columns under blast loading using Finite Element Method

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ABSTRACT

The columns are utmost important and most vulnerable part of the structures, the ideology of strong column and week beam is to prevent total collapse of the building while resisting the lateral loads and therefore columns should be built with high safety parameters. Thus column with greater stiffness than beam is provided. The present work deals with three dimensional nonlinear finite element (FE) analyses of a reinforced concrete column subjected to blast loading. The finite element package ABAQUS/Explicit was used to model a reinforced concrete column and the concrete damage plasticity approach was used to define the non-linearity of concrete. The stress-strain response of concrete and reinforcement has been simulated using concrete damaged plasticity model and elastic-perfectly plastic model, respectively. TNT explosive has been simulated using Air blast interaction under CONWEP definition. Parametric sensitivity studies have been performed by varying the spacing between stirrups as 125, 175, 225 and 275 mm and also diameter of main reinforcement bars are varied as 16, a20, 25, 28 and 32 mm to determine the displacement and stress variations. Efforts are also made to determine the effects of incident blast wave falling on the different face of the column. It is observed from the results that modeled column structure undergo significant deformation with variations. It is also observed that blast resistance increases as the spacing between stirrups decreases. Also, deformation of the column decreases as the diameter of the reinforcement bars increases.

Keywords : Nonlinear explicit analysis, TNT, Blast loading, column, concrete damage plasticity, CONWAP.

I. INTRODUCTION

The threat of terrorism rising all over the world has increased the awareness among people. There have been many structural failures in the past incidents like Oklahoma City bombings, Scud missile attacks and Khobar towers bombing in Saudi Arabia. Efforts have been made to design structures which offers better resistance against blast explosion. Studies are being conducted on the behaviour of structural members subjected to blast loads. Designing buildings to resist failure due to blast loads is an extremely complex procedure. But, with the recent increase in public awareness of possible terrorist attacks worldwide, many organizations and agencies are currently trying to secure methods of constructing facilities that will survive blast loads due to explosions. During the 1960s, an extensive research program was funded by the governments to develop criteria for the analysis and design of blast-resistant structures. A majority of the early academic research in the field of blast design was done at the University of Illinois at Urbana-Champaign and at the Massachusetts Institute of Technology. This resulted in the Tri-Services Manual designed by the Army as "TM 5-1300: Structures to Resist the Effects of Accidental Explosions," which was subsequently revised in 1990. This revision incorporates the research conducted over the intervening period (01).

The need and requirements for blast resistance in buildings have evolved over recent years. Buildings have become more complex and have increased in size thus increasing the risk of accidental explosions. Such explosions have demolished the buildings, in some cases resulting in substantial personnel causalities and business losses. Damage to the assets, loss of life and social panic are factors that have to be minimized if the threat of terrorist action cannot be stopped. Designing the structures to be fully blast resistant is not a realistic and economical option, however current engineering and architectural knowledge can enhance the new and existing buildings to mitigate the effects of an explosion (02).

Explosion process for High Explosives.

Explosion occurs when a gas, liquid or solid material goes through a rapid chemical reaction. When the explosion occurs, gas products of the reaction are formed at a very high temperature and pressure at the source point. These high pressure gasses expand rapidly into the surrounding area and a blast wave is formed. Because the gases are moving, they cause the surrounding air to move. The damage caused by explosions is produced by the passage of compressed air in the blast wave. Blast waves propagate at supersonic speeds and reflected as they meet objects. As the blast wave continues to expand away from the source of the explosion its intensity diminishes and its effect on the objects is also reduced. Close to the source of explosion, the blast wave formed is violently hot and expanding gases will exert intense loads which are difficult to quantify precisely. Once the blast wave has formed and propagating away from the source, it is convenient to separate out the different types of loading experienced by the surrounding objects. Three effects have been identified in three categories are,(a)Air Shock Wave- the effect rapidly compressing the surrounding air. (b)Dynamic Pressure- The air pressure and air movement effect due to the accumulation of gases from the explosion chemical reactions (c) Ground Shock Wave - the effect rapidly compressing the ground.

The air shock wave produces an instantaneous increase in pressure above the ambient atmospheric pressure at a point some distance from the source.
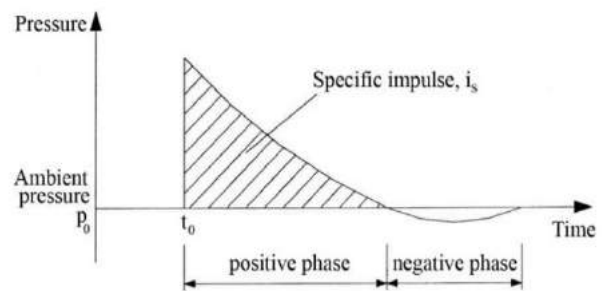
Fig. 1. Blast wave pressures plotted against time. (01).

As a consequence, a pressure differential is generated between the combustion gases and the atmosphere, causing a reversal in the direction of flow, back towards the center of the explosion, known as a negative pressure phase. This is a negative pressure relative to atmospheric, rather than absolute negative pressure as shown in fig-1. Equilibrium is reached when the air is returned to its original state. [01]

The basic methodology that we have adopted in our study is non-linear dynamic analysis. Since in the case of heavy loading that acts for very short time (dynamic loading), the geometry of the structure changes and the stress induced due to the loading does not makes linear relation with the strain and big displacement occurs in the structure.

Litrature Review

In the literature study, analyses on effects of blast loading on various structures have been carried out. Zeynep Koccazet,al [1] shed light on blast resistant building design theories the enhancement of building architectural and structural design process to provide security against the effects of explosives has been discussed, concluded saying that, Essential techniques for increasing the capacity of a building to provide protection against explosive effects must be developed both in architectural and structural approach. Manmohan Dass Goel [2] discussed on various strategies of blast mitigation, mainly include to increase the standoff distance, as blast pressure decays very rapidly with the distance. Duo Zhang et,al [3] concluded that sacrificial blast wall provides a better solution and can be adopted or designed against an explosive induced threat and blast-induced threats against a structure should be included in planning and design stages of structural components. Liu (2009) modeled the Subway tunnels under explosive load using FEM, CONWEP module was used for explosive load. The analysis performed not considering the high strain rate behavior of soils

under explosive loading. S.V.Chaudhari [4] modeled a 3D model of concrete cube is prepared using smeared crack model and concrete damage plasticity approach, then validation of the model to the desired behavior under monotonic loading. Values of stress obtained was closing matching to each other. Tomasz Jankowiak [5] showed a proper route for to prescribe the material parameters concrete damage constitutive model (CDP) which enables a proper definition of the failure mechanisms in concrete elements. He concluded saying CDP can be used to model the behavior of concrete and the reinforced concrete structures and the other pre-stressed concrete structures in advanced stages of loadings.

By undergoing a thorough literature review we can conclude that very less effort have been made to analyse the structural components for blast loading. Specific objective of this paper is to analyse and understand the behaviour of reinforced concrete columns under blast loading conditions using finite element method. To determine the stress and strain behaviour of reinforced concrete beam and column structure under random vibrations using non-linear explicit analysis method. The columns are utmost important and most vulnerable part of the structures as the front face of building experiences peak overpressures due to reflection of an external blast wave. It is very tiresome to analyse the complete structure before understanding the individual units of the structure under blast loading conditions. This paper signifies to result the stress and displacement of RCC column structure by varying its skeletal properties i.e. reinforcement. The work emphasizes to understand the variation of stress and displacement of column under time, by varying the diameter of main reinforcement as 16, 20, 25, 28 and 32 mm also spacing of stirrups as 125, 175, 225 and 275 mm. Further results can be used to find out the bending moments and shear forces in the member.

Methodology

A finite element method is best suited technique to obtain an approximate solution to a class of problems governed by elliptic partial differential equations. ABAQUS is a software suite for finite element analysis and computer-aided engineering, originally released in 1978. The Abaqus product suite consists of five core software products. The one which is used here is Abaqus/Explicit, a special-purpose Finite-Element analyzer that employs explicit integration scheme to solve highly nonlinear systems with many complex contacts under transient loads.

Finite element simulation

The simulation involves modelling of reinforced column element, where main bars and stirrups are modelled initially which is reinforced with concrete as shown in fig-2, further proper boundary conditions were assigned. Material properties, elasticity, poisson's ratio and nonlinear plastic law to the elastic material (e.g. consider the case of an elastic perfectly plastic Von-mises type material model) is assigned to the members. Special properties like Concrete damage plasticity (CDP) constitutive model [6] properties were assigned in concrete compression damage by providing stress and strain values for the required concrete characteristic strength. The aim CDP is to obtain a model, which describes the important characteristics of the failure process of concrete subjected to multiaxial loading. Concrete tension damage property (Bischoff and Perry 1991).) is assigned determining the tension stress and corresponding strain values and yield stress and corresponding cracking strain values. Elastic perfectively plastic behavior for the steel is assigned in the material module and the model is meshed.Interaction of load and member is assigned as Conwep model [7] providing airblast and suitable standoff distance for the TNT blast, finally analysis is run to obtain the maximum displacement and stresses with respect to time period as shown in fig-3.
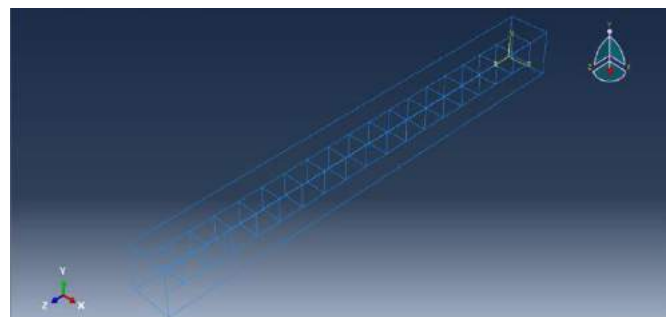
Fig. 2. Assembly Model (Wired View)
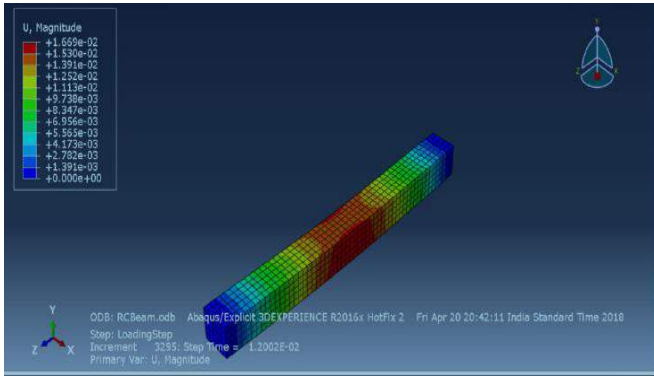
Fig. 3. Showing the beam displacement at step time 1.2002E-02.

B. Validation of Finite Element Analysis

To ensure the validity of the numerical simulation, the results of beam deflection of an experimental RC beam under close-in blast loading [8] has been compared with the simulated result using FE software ABAQUS. Experimental investigation emprise on scaling of RC Beam under close-in blast load , to study of damage modes and damage levels of RC beams under different blast loads and to study of dynamic response of RC Beams. The experimental procedure consists of testing of 8 beams of varying dimensions, mass of TNT, standoff distance and scaled distance. Beam displacement is determined by keeping a long needle inside fine sand covered by pinholes below the experimental beams. For our validation a single beam no B2-2 was considered whose displacement was already determined. FEM modeling was done using software ABAQUS as shown in above fig-2. Concrete damage plasticity (CDP) model for unconfined concrete compression values for the grade of concrete is calculated as shown in the fig-4a. The value of yield stress to the inelastic strain of concrete is calculated is as shown in fig-4b [9]. Further tension behavior concrete is assigned as shown in fig-4c and yield stress and cracking strain value is calculated using eqn-03 is as shown in fig-4d. Nonlinear steel behavior is taken as elastic-perfectly plastic model, where it doesn't account for stain hardening the stress increases linearly until the yield strength is reached, and then the material offers no further resistance to deformation, as shown in fig-5. From the experimental analysis the maximum displacement observed in the B2-2 is 25 mm; our simulation result gave a maximum displacement 17 mm which is very close to the experimental results. The analysis result is as shown in the fig-6.
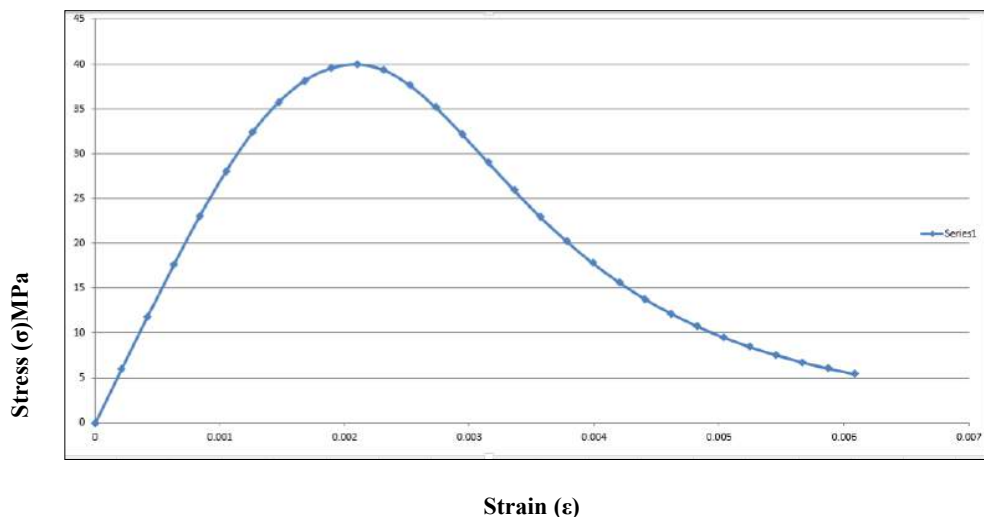
Strain (ε)
Fig. 4a. Compression Stress-Strain Model of concrete.
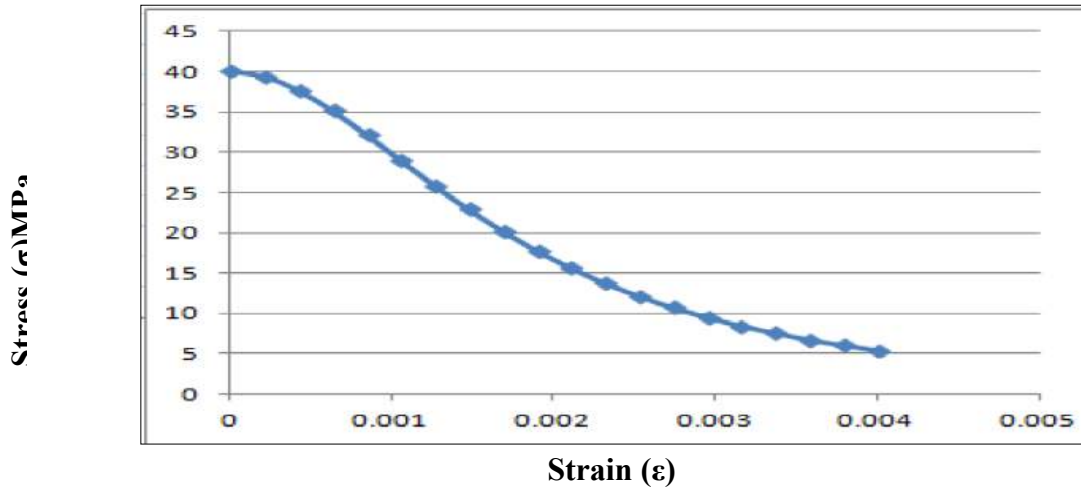
Fig. 4b. Yield Stress v/s Inelastic Strain of concrete
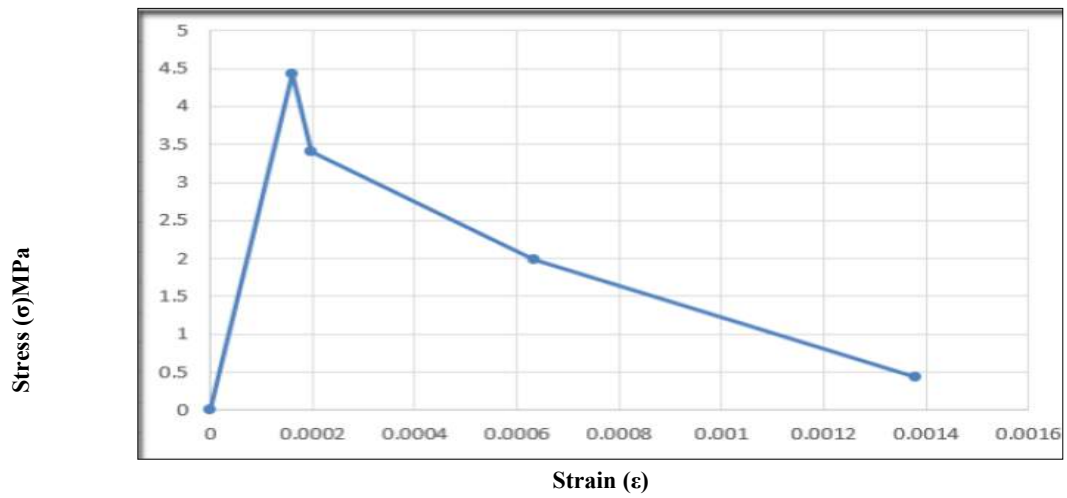
Fig. 4c. Tension Stress-Strain Model of concrete.
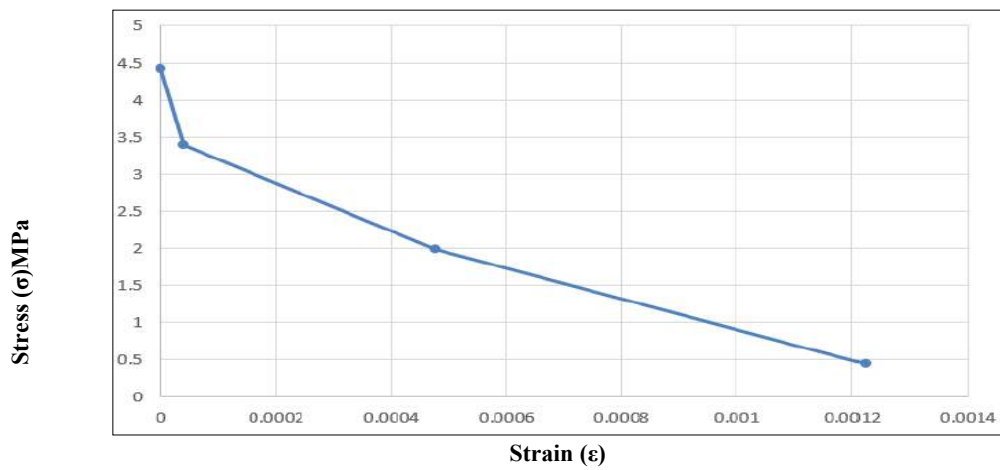
Fig. 4d. Yield Stress v/s Cracking Strain of concrete
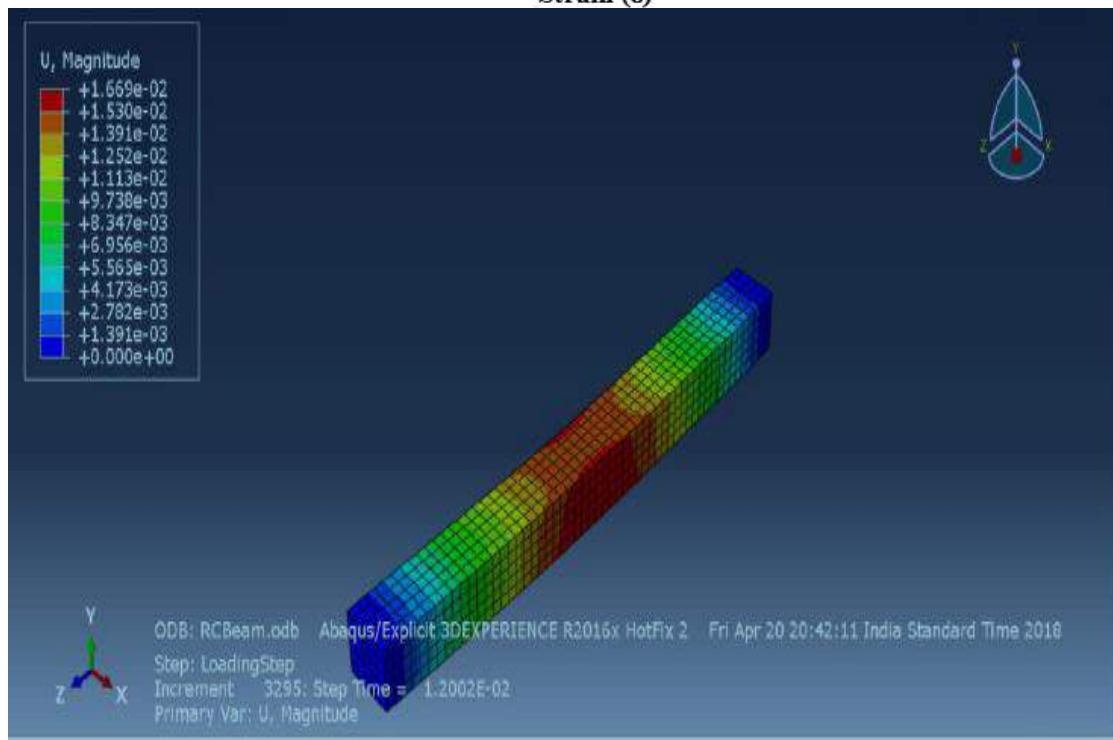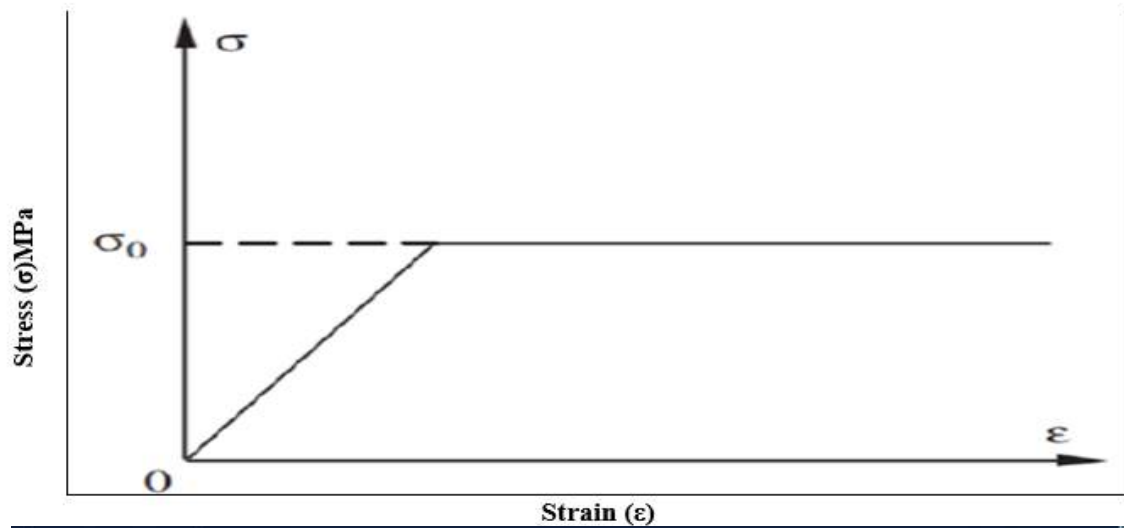
Fig. 6. Deflection of Beam B2-2.

Parametric Studies

Parametric studies include analysis of RCC columns for constant dimensions, varying the skeletons, i.e. diameter of main reinforcement and diameter and spacing of the stirrups/ties. Efforts have made to draw a comparison of maximum stress and displacement values with respect to step time. Probable conclusions were also drawn from the variation curves are as follows.

Variation of diameter of main reinforcement.

Here for the dimension of the column taken is width as 300mm, depth as 500mm and length as 3450 mm, 4 no of reinforcement at corners, whose diameter of the main reinforcement varies from 16mm, 20mm 25mm, 28mm and 32mm. Diameter of stirrups taken is 8mm spaced at 125mm c/c. Clear concrete covered is taken 40 mm, a common standoff distance of 0.4m and 0.45 kg mass of TNT is assigned at the bottom of the column in each parametric study. Variation in

stress values at increasing step time of impact as shown in fig-7a.
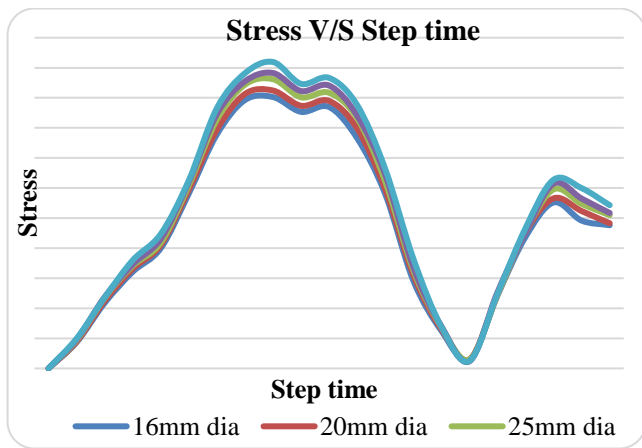
Stress V/S Step time

Fig. 7a. Stress variation v/s Increasing Step time

From the above figure we can conclude the with an increase diameter of main reinforcement from 16 to 32 mm, the resistive stress generated within the column structures increases. For 16, 20, 25, 38 and 32 mm diameter the maximum stress generated in 451.352, 462.165, 480.981, 491.306 and 509.604 N/mm2 respectively for a step time of 4.00E-03,shown in fig-7c. Since the blast force is a sudden cyclic wave, the beam generate residual stresses, which goes on decreases in the next cycle.Fig- 7b shows variation of displacement values at increasing step time.

Displacement V/S Step time
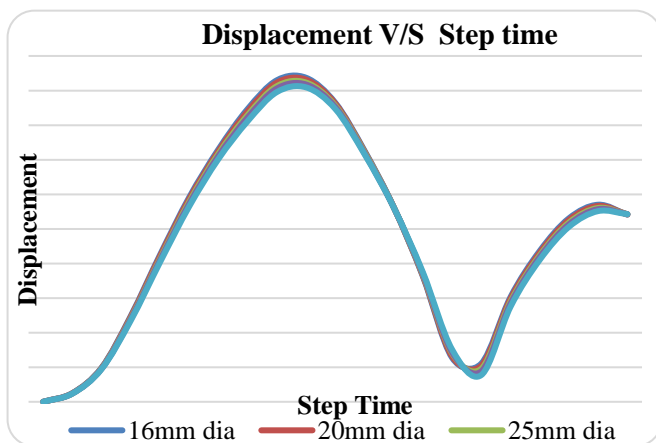
Fig. 7b. Displacement variation v/s Increasing step time.

MAX STRESS V/S MAIN REINFORCEMENT
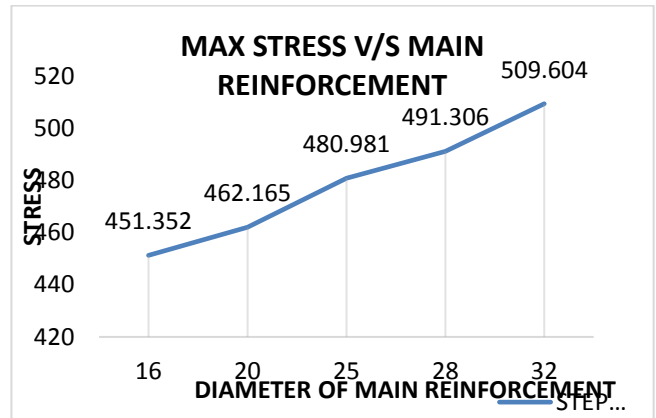
Fig. 7c. Maximum stress v/s diameter of main reinforcement

With an increase in diameter of main reinforcement from 16 to 32 mm displacement decreases. For 16, 20, 25, 38 and 32 mm diameter the maximum displacement generated is 37.4786, 37.2606, 36.9251, 36.7002 and 36.3689 respectively for a step time of 4.50E-03, as shown in fig-7d. Further the beam undergoes residual deflection as shown in the figure 7a.

MAX DISPLACEMENT V/S DIAMETER OF MAIN BAR
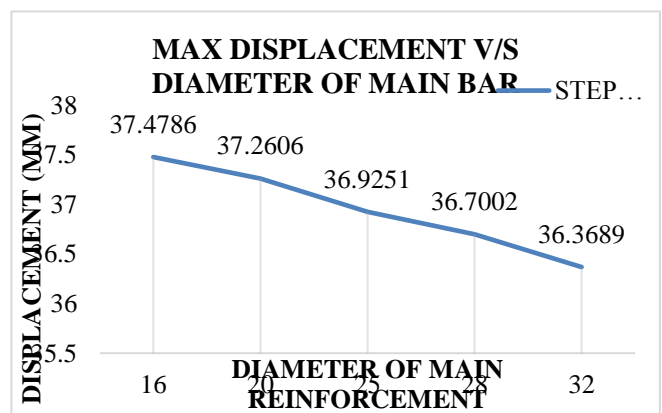
Fig. 7d. Maximum displacement v/s diameter of main reinforcement

Variation in stirraps

Here variation of stress and displacement with the variation of stirrups/ties spacing is studied, the diameter of stirrup is taken constant as 8mm but the center to center spacing is varied as 125mm, 175mm, 225mm and 275mm. The properties and loading conditions are taken same as above, but the diameter

of main reinforcement was taken as 16mm. Fig-8a shows the maximum stress generated with respect to variation of spacing and fig-8b shows the maximum displacement with respect to variation of spacing.
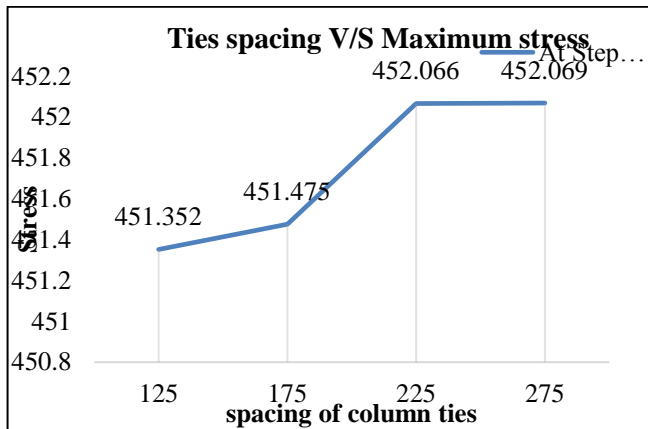
Fig. 8a. Maximum stress v/s ties spacing.
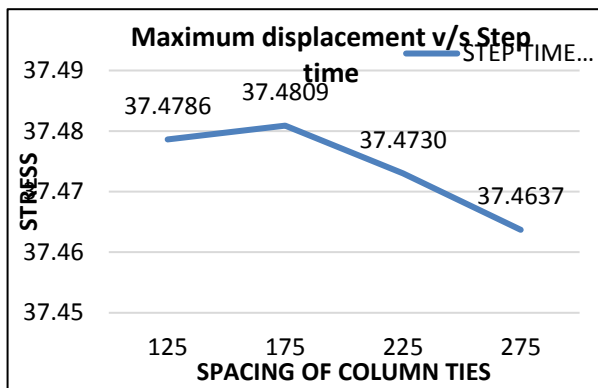
Fig 8b. Maximum displacement v/s ties spacing.

From the variation of stress with respect to stirrups spacing we can conclude that, stress developed with a close spacing is less in comparison with maximum spacing. Even though the variation is very less, but the percentage of variation is more. The graph gradually increases as the spacing of stirrups is more than 200mm further it stays constant up to 275mmspacing.From the variation of maximum displacement with respect to tie spacing we can say that with the closer stirrups spacing beam undergo more displacement compared to maximum spacing. It is also identified that the displacement curve is smoother in case of spacing up to 175mm, after 200 mm the curve is not so much smooth, maximum displacement and smoother curve indicate the ductile behavior of the member, even though the variation is

very less, still we can conclude column with closer spaced ties behave ductile in compare to freely spaced member.

Conclusion

In this paper RCC columns are analyzed for blast loading condition using a Finite element software ABAQUS, the work aims to investigate the behavior of column under variation of its skeletal components i.e. reinforcements. Despite the fact that, the magnitude of the explosion and the loads caused by it cannot be anticipated perfectly, the most possible scenarios will let to find the necessary engineering and architectural solutions for it. Following conclusion can be drawn from the above work.

1. Even though the analysis of structure under blast loading is complicated, finite element method and software helps us to produce reliable results.
2. Column with proper combination of main reinforcement and properly spaced ties undergo less stresses distribution on the structure and deformations under blast load.
3. By increasing the diameter of main reinforcement, column can achieve resistance towards lateral load and deformation.
4. The significance of providing less confined ties in the columns would contribute lateral load resistance increasing ductility to the column to deformation and producing less stress.
5. It is recommended to provide ties in the column not more than 200 mm to resist blast loading.
6. Supporting the above statement, variation of maximum displacement with ties spacing (Fig 8a and 8b) would suggest that close spaced stirrups enhances its ductility providing maximum displacement compared to maximum spacing.

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Fly Ash - Lime and Gypsum Hollow Blocks

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ABSTRACT

FaL-G is the product name given to a cementitious mixture composed of Fly ash (Fa), Lime (L) and Gypsum (G). It is low-cost and environmental-friendly material very useful even in rural housing industry. FaL-G in certain proportions, as a building material is an outcome of innovation to promote large-scale utilization of fly ash. It gains strength like any other hydraulic cement in the presence of water and it is water resistant when hardened. This paper addresses the technology of making FaL-G mortar compressed hollow blocks with low-calcium (Class F) dry fly ash as the base material. The FaL-G masonry hollow blocks were prepared without the use of conventional cement. Quarry dust and sand were used as fine aggregates as sustainable materials. The properties and compressive strength of FaL-G masonry hollow blocks were tested with different parameters. The experimental results reveal that the FaL-G hollow blocks are suitable to be used for the construction of masonry structures.

Keywords : Fly Ash, Lime, Gypsum, Quarry Dust, Sand, Mortar, Compressive Strength.

I. INTRODUCTION

Nowadays the emission of carbon dioxide into the atmosphere is being increased gradually day by day. Considerable amount of fossil fuel, coal and oil are burnt for different reasons. This weakens the heat–trapping blanket that surrounds the planet causing global warming. Various alternatives can be considered to protect the planet. The rapid increase in the capacity of thermal power generation has resulted in the production of a huge quantity of fly ash. The prevailing disposal methods are not free from environmental pollution and ecological imbalance. On the other hand, the production of each ton of cement releases equal amount of carbon dioxide to the atmosphere. The usage of cement can be reduced by using the other possible cementing materials without compromising the strength and durability.

The most basic building material for construction of houses is the usual burnt clay brick. A significant quantity of fuel is utilized in making these bricks. Also, continuous removal of topsoil, in producing conventional bricks creates environmental problems. There is strong need to adopt cost effective sustainable technology using local materials and appropriate/intermediate technologies using materials with efficient and effective technology inputs. Different methods are adopted to produce the building blocks using cement, lime-fly ash, lime-slag bindings etc. There is a need to develop simple and highly effective technologies for producing the building blocks. The imperative need to produce more building materials for various elements of construction and the role of alternative options would be in sharp focus. This is in considering the short supply, increasing cost, energy and environment considerations for traditional and

conventional materials. The possibility of using innovative building materials and technologies, using waste material like fly ash has been considered.

There is a strong need to adopt cost-effective and environmentally appropriate technologies by upgrading of traditional technology, as also using local materials as well as appropriate and intermediate technologies employing modern construction materials with efficient, effective technology inputs. Building materials is an area where enormous amount of innovation for cost reduction can be achieved. It is cost effective and environmental-friendly material very useful even in rural housing industry. FaL-G in certain proportions, as a building material, is an outcome of innovation to promote large-scale utilization of fly ash by Bhanumathidas and Kalidas [1]. It gains strength like any other hydraulic cement, in the presence of water, and is water resistant when hardened.

Large amounts of gypsum and fly ash are available at phosphoric acid manufacturing plants and thermal power plants, respectively. These materials can be used to source sulphate and silica alumina. Gypsum contains impurities of phosphate, fluoride, organic matter and alkalies which prevent its direct use as building material. It is one of the calcium sulphate's rich residues. Phosphogypsum is an important by-product of phosphoric acid fertilizer industry. It consists of $CaSO_4.2H_2O$ and contains some impurities such as phosphate, fluoride, organic matter and alkalies. Approximately 5 million tons of phosphogypsum is produced each year in India [2]. Cementitious binder, FaL-G, finds extensive application in the manufacturing of building components and materials such as bricks, ,solid blocks,hollow blocks and lean concrete. FaL-G technology enables production of hollow blocks with a simple process of mixing and water curing. Due to such appropriate technology apart from economy, conservation of energy and pollution control are also achieved [3].

It has been reported that FaL-G mortar can be used in making the masonry hollow block units by different combinations of fly ash, lime and gypsum [4] .FaL-G technology contributes to the conservation of energy and reduces environmental degradation [5]. Since it is manufactured using industrial wastes and by-products, the environmental impacts are mitigated. FaL-G plants have the advantage of continuous year-wide operation and hence provide year-long employment opportunity to skilled artisans.[6] It creates self-help livelihood opportunities for the people. In certain cases, where by-product lime is not available in adequate quantity, ordinary Portland cement is used as the source of lime, producing the same quality of bricks and blocks [7,8].

SCOPE OF THE RESEARCH

FaL-G is relatively economical material derived from base materials like fly ash, lime and gypsum. The research reported till date speaks about the random use of the material without any rational approach. The report on proportioning, strength development in FaL-G is very less. Also there is large scope for the development of FaL-G compressed blocks/bricks made from mortar. In this research, FaL-G mortar hollow blocks were prepared and various properties were studied.

MATERIALS AND METHODS

A Class F fly ash was procured from Raichur thermal power plant. Locally available lime was slaked and sieved through 1.18 mm sieve and stored in air tight container. Dry calcinated phosphogypsum was procured from a fertilizer industry. The weighed quantity of fly ash and gypsum were mixed in dry condition. Lime was added to the mixture to obtain a uniform mix. This mix was termed as FaL-G binder.

TABLE 1: MIX PROPORTIONS OF FAL-G BRICKS

Mix designation	FaL-G Binder proportion			Fine aggregate	FaL-G Binder : Fine aggregate Ratio
	Fly ash	Lime	Gypsum		
H1	50	40	10	Stone dust	1:1
H2	50	40	10	Stone dust	1:1.5
H3	55	35	10	Stone dust	1:1
H4	55	35	10	Stone dust	1:1.5
H5	60	30	10	Stone dust	1:1
H6	60	30	10	Stone dust	1:1.5
H7	65	25	10	Stone dust	1:1
H8	65	25	10	Stone dust	1:1.5
H9	50	40	10	Sand	1:1
H10	50	40	10	Sand	1:1.5
H11	55	35	10	Sand	1:1
H12	55	35	10	Sand	1:1.5
H13	60	30	10	Sand	1:1
H14	60	30	10	Sand	1:1.5
H15	50	40	10	Sand	1:1
H16	50	40	10	Sand	1:1.5

FaL-G mortar was prepared using FaL-G as binder and Quarry dust, sand and pond ash as fine aggregates. The procedure adopted was same as that of cement mortar. Tap water was used to mix the ingredients. The ingredients were mixed thoroughly by kneading until the mass attained uniform consistency. FaL-G mortar is a dry frictional material at water/binder ratio of 0.2. FaL-G

compressed hollow blocks were prepared using FaL-G mortar at various binder-fine aggregate ratios. The details of mix used for preparing FaL-G hollow blocks are shown in **Table 1**. The hollow blocks were designated as B1 – B24 for convenience.

Moulds of internal dimension 400 mm x150 mm x 200 mm were used for casting the compressed hollow blocks. The FaL-G mortar mix was placed in the moulds in two layers. Each layer was compacted and compressed using a vibrating table. The compressed brick was then de moulded and stored on the platform. They were cured in wet gunny bags for a day or two. Later they were cured by sprinkling water till the age of 28 days or date of testing whichever was earlier. The properties of FaL-G hollow blocks were studied i.e., dry density, Initial rate of absorption, water absorption, Compressive strength of block and stress- strain characteristics.

RESULTS AND DISCUSSION

The properties of the FaL-G bricks are indicated in **Table 2** for all the series considered. It was found that the density of FaL-G hollow blocks was in the range of 1.465 to1.654 g/cc for all the series. This density was marginally less compared to the conventional concrete hollow block available in the market. The initial rate of water absorption of the bricks varied from 3.92 to 4.4 kg/m²/min which is considered as less as per ASTM C-67 [9]. The percentage of water absorption was found to be less than 17.56% for all the series against the maximum limit of 20% as per IS 3495-1976[10].

TABLE 2: PROPERTIES OF HOLLOW BLOCKS OF SIZE 400MM X150MM X 200MM

Mix designation	Average Dry density in g/cc	Average Initial rate of absorption of brick in kg/m²/min	Average water absorption of brick in %
H1	1.635	3.960	15.786

Mix designation	Average Dry density in g/cc	Average Initial rate of absorption of brick in kg/m²/min	Average water absorption of brick in %
H2	1.654	3.928	15.712
H3	1.622	3.981	15.924
H4	1.637	3.944	15.804
H5	1.597	4.040	16.159
H6	1.619	3.986	16.052
H7	1.585	4.072	16.287
H8	1.612	4.003	16.147
H9	1.535	4.197	16.788
H10	1.568	4.113	16.617
H11	1.507	4.273	17.089
H12	1.534	4.202	16.919
H13	1.492	4.348	17.262
H14	1.507	4.274	17.094
H15	1.465	4.408	17.564
H16	1.481	4.346	17.410

Parameters:
- ❖ Age: 7, 14, 28, 56, 72 and 90 days
- ❖ Binder-to-aggregate ratio: 1:1 and 1:1.5
- ❖ Quantity of fly ash   : 50, 55, 60 and 65%
- ❖ Quantity of lime   : 25, 30, 35 and 40%

Figure 1, 2 and 3 show the variation of compressive strength of the FaL-G hollow blocks with age for quarry dust, and sand respectively. It is quite obvious that the strength increases with age in all the cases. It is due to continues reaction between the FaL-G binder and water as discussed in the introduction. The compressive strength was around 4 MPa at the age of 28days   and around 5.5 MPa at the age of 90 days. The minimum strength at the age of 28 days is more than 3MPa in most of the cases. This strength would be sufficient to use them as masonry units as per IS 3495-1976 [10].
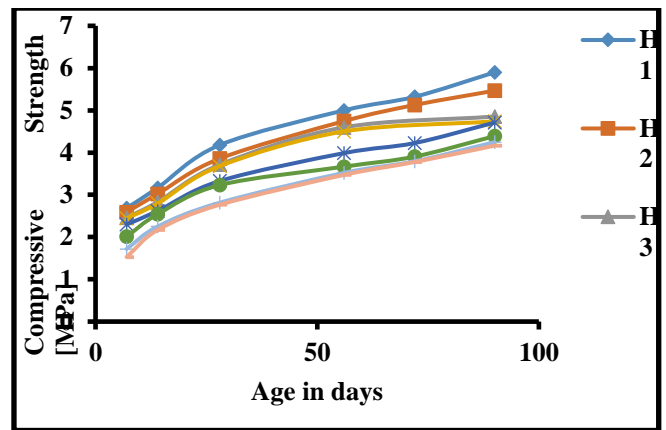
Fig. 1. Variation of Compressive Strength with age with Stone Dust as fine aggregate.
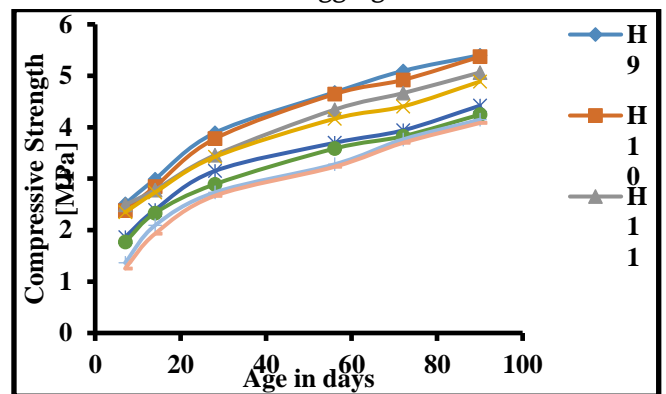
Fig. 2. Variation of Compressive Strength with age with Sand as fine aggregate

Figure 3 indicates the compressive strength of FaL-G bricks at the age of **7, 14, 28, 56, 72 and 90** days in order. The column indicates the strength of the brick having binder-to-aggregate ratio of **1:1** and with ratio of **1:1.5**for different series **H1to H8**with quarry dust as fine aggregate. Similarly **Figure 4** indicates for different series **H9 to H16** with natural sand as fine aggregate. It can be observed that as the ratio of binder-to-aggregate increases the strength decreases in all the cases. It is due to less binder availability in the mortar.
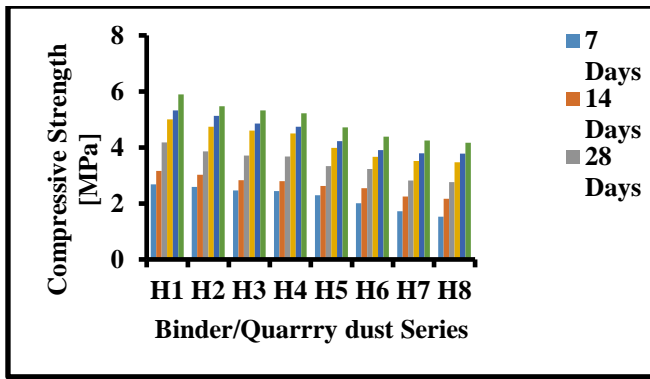
Fig. 3. Compressive Strength of H1 to H8 of Binder/Quarry dust Series for various ages
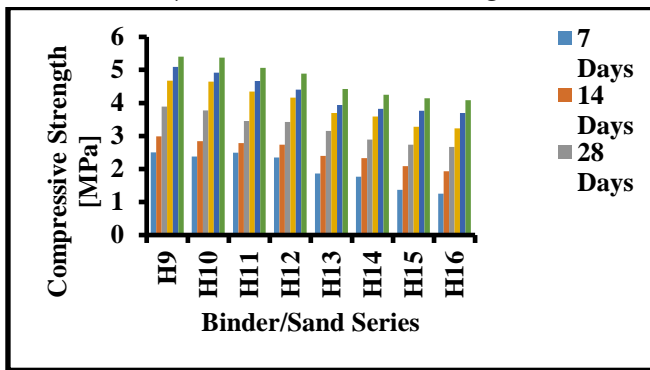
Fig. 4. Compressive Strength of H9 to H16 of Binder/Sand Series for various ages

The series considered for the variation of fly ash with H1 to H8 [binder/quarry dust series] and H9 to H16 [binder/Sand series] with 50, 55, 60 and 65% of fly ash respectively. For convenience, the age of the blocks are considered up to 90 days with quarry dust and sand as fine aggregate. **Figure 5** indicates the variation of compressive strength with the percentage of fly ash. It was found that the compressive strength decreases with the increase in fly ash content, the optimum being 50%. Same observation was found in the research reported by Radhakrishnan [4]. The series considered for the variation of lime from H1 to H16 series with 40 35, 30 and 25% of lime respectively. The variation of compressive strength with the lime content is shown in **Figure 6**.
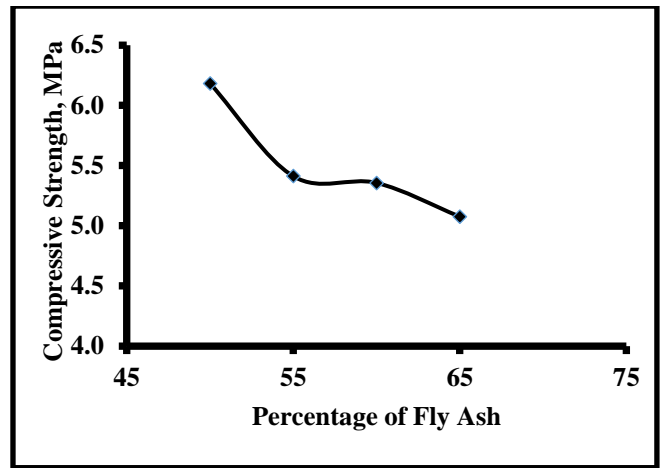
Fig. 5. Variation of Compressive Strength with fly ash content
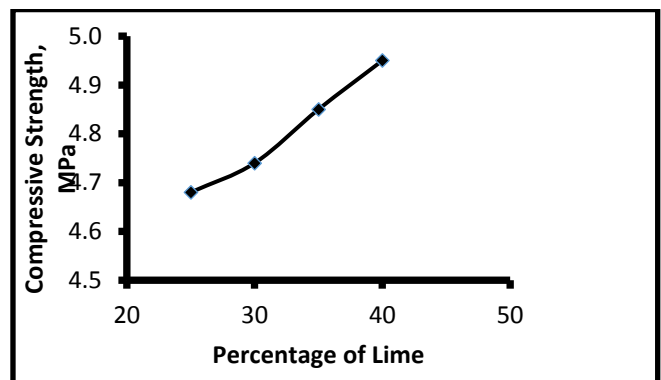
Fig. 6. Variation of Compressive Strength with lime content

It can be noticed that the increase in lime content increases the strength. In FaL-G, as the fly ash content increases the lime content should decrease as the gypsum is maintained at 10%. Modulus of elasticity of hollow block were tested at 28 days for the series H1[50:40:10],H3[55:35:10] with quarry dust as fine aggregate, H9[50:40:10],H11[55:35:10] with natural sand as fine aggregate. The modulus of elasticity was found to be 1768 MPa, 1666 MPa,1876 MPa and 1527 MPa at the age of 28 days respectively. **Figures 7, 8 9and 10** represents the stress-strain behaviour for different series of the hollow blocks. This range of modulus of elasticity is quite satisfactory to use these bricks as masonry units.

$$y = -181855x^2 + 1768.7x + 0.1836$$
$$R^2 = 0.9902$$
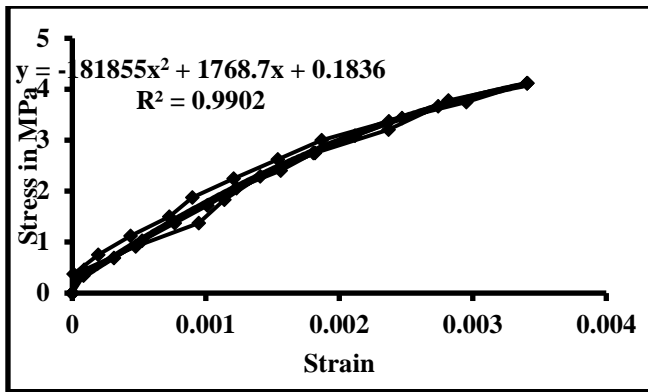
Fig. 7. Variation of Modulus of elasticity at 28 days of series H1[50:40:10][QD]

$$y = -205996x^2 + 1666.6x + 0.1452$$
$$R^2 = 0.9885$$
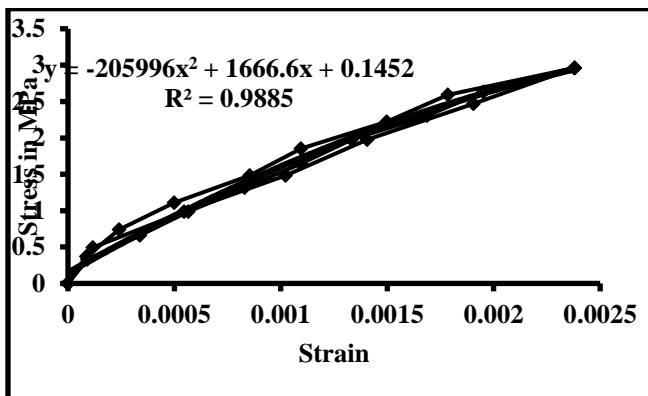
Fig. 8. Variation of Modulus of elasticity at 28 days of series H3[55:35:10][QD]

$$y = -247587x^2 + 1876.5x + 0.1769$$
$$R^2 = 0.9881$$
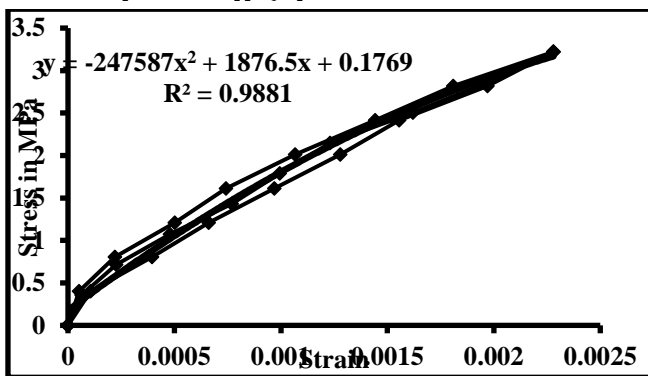
Fig. 9. Variation Modulus of elasticity at 28 days of series H9[50:40:10][Sand]

$$y = -177644x^2 + 1527.8x + 0.0853$$
$$R^2 = 0.9931$$
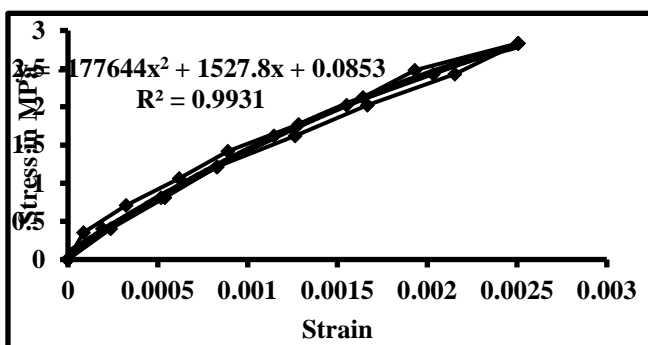
Fig. 10. Variation Modulus of elasticity at 28 days of series H11[55:35:10][Sand]

CONCLUDING REMARKS

➤ FaL-G compressed masonry hollow blocks can be prepared economically by using industrial wastes like fly ash, lime, gypsum, stone dust and Sand.

➤ It was found that the dry density, IRA and water absorption of FaL-G compressed bricks were in the range of 1.465 to1.654 g/cc., 3.92 to 4.4 kg/m²/min and less than 17.56 % respectively.

➤ The hollow blocks attained considerable strength around 4MPa at the age of 28 days to use them as masonry units with adequate modulus of elasticity.

➤ In view of the above, it can be concluded that FaL-G masonry units can effectively replace conventional masonry units.

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Fashion sales prediction using Data Mining

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ABSTRACT

Online shopping has widened the sales of attires. Wide range of fashion outfits are made available to the customers at much cheaper rate. Merchandiser has reduction in cost because, it is not essential for him to have a showroom or sale staffs. Even a naïve fashion designer can sell their products through shopping websites. Online shopping sites also provide a platform to understand the fashion market. Data mining can be used to understand the fashion market by predicting the customer mindset. This paper attempts to create a learned model which would predict if the dress designed would be sold or not.

Keywords : Classification, Fashion Sale Prediction, Online Shopping

I. INTRODUCTION

Online shopping provides a comfort for the customer, they can do shopping from any place at any time. It gives an extensive array of products for the customers which is not possible to bring under one roof. Customer also can cancel and return the products whenever their desire. Online shopping also grasps the interest of customer by the huge discount that they provide.

There are also some cons in Online shopping, there is no personnel touch in shopping. The customers do not see the product before shopping. There can be a difference between how the dress looks in real and in photo. A prediction of whether dress can be bought or not would help the customers to make an intelligent decision.

Fashion in general is influenced by the Film industry, but there are certain unknown factors which influences the fashion industry as well. Fashion prediction is vital for many reasons, if the merchandiser can know what kind of goods will be sold, then he can have a strong hold over the market. The merchandiser can influence the customers to buy their product thus increasing their profit. Internet and online shopping play an important role in fashion.

Online shopping site has huge amount of information on the kind of dress people like to buy. When data is available in huge amount it is possible mine pattern and make prediction using data mining. Our age is data age, the presence of huge data makes our life easy. From huge amount of weather data, it is possible to predict day today weather, medical data of patients enable us to predict disease, sales data enables us to predict the mood of the customers.

Data mining is the extraction of information or knowledge from huge volume of data. Data mining involves classification, clustering, association mining. Classification and Clustering techniques create models that predicts the category to which a given data belongs to. In classification learning happens over labelled data. In clustering learning happens over unlabelled data. Association mining is a

technique through which the model suggest that a collection of data occur together frequently.

In this paper we attempt to create a learned model using WEKA. This model will be trained using a dress dataset downloaded from UCI machine learning repository [1]. This dataset was created in 2014. It contains 501 instances and 13 attributes.

LITERATURE SURVEY

Few research papers have tried to predict Fashion using data mining. In [2] the author gathers details from social networking site, used natural language processing to extract information and create a decision support model for fashion prediction. There some papers which suggest similar predictions based on books movies etc.

In [3] the data is extracted from fashion trends web pages. Features of previous seasons fashion trend and its corresponding sales value is used to forecast whether new fashion trends features would be hit in the market. After feature extraction Artificial neural network, fuzzy logic is used to create a working model. Coefficient of determination is used to assess the quality of model proposed.

[4] states the difficulty of fashion forecasting. It is a challenge because fashion grows in a non linear fashion, when season and dress attributes are considered. In this paper the author suggests a two-stage prediction model, a short term and long-term prediction with Artificial Neural networks.

[5] -this paper creates an intelligent system to find combination for outfits. Combination for jewelry dress etc. This done by deep learning of meta data of fashion sites. Customer buying pattern is analyzed generally using collaborative filtering, but there is a disadvantage of collaborative filtering. Collaborative recommendation worls on static data hence does not keep up with the change needs of customer. In Fashion industry needs change at a rapid rate. Therefore, in [6] suggest a Collaborative filtering that works on dynamic data.

In [7] has a prototype for a model, this would predict the items in shopping list of customers and provide personalized interaction with customer to improve his experience. [8] attempts to use text mining in extraction of fashion based information from renowned fashion blogs this done to keep up with dynamic Fashion industry. Korean fashion blog is used to do the analyses.

From literature survey we are able to understand that the UCI machine learning dataset are not used by the research. The research paper predominantly uses text mining to extract information and use Neural network to do the prediction. In this research paper we attempt to use dress dataset and explore the various machine learning algorithms to arrive at a consensus.

DATA MINING DEFINITIONS

Data mining is extraction of useful information from data. Data mining is a four steps process which involves: Data collection, Data preprocessing, Machine learning, Pattern Evaluation.

3.1 Data Collection

Collecting or downloading data suitable to problem domain. With the improvement of data mining research this stage has predominantly become finding a suitable source of data from machine learning repository.

3.2 Data Preprocessing

Data cannot be fed as such to machine learning algorithm. Data has to transformed or reduced based on requirement.

Data is usually noisy, contain unnecessary information which might result in less accuracy. Data preprocessing is cleaning of data before machine learning. [9] suggests the use of data pre-processing to improve machine learning. Classification and clustering accuracy is predominantly dependent on the proper representation of data.

3.3 Machine Learning

Machine learning literally means, make the machine learn, machine learns by processing the data with various machine learning algorithm [9]. There is no fixed algorithm to provide high accuracy this is called No Free lunch theorem [10], however deep learning provides a better accuracy in most cases.

For any application it is important to apply few machine learning algorithms to find out the best suited model. Machine learning algorithms can be grouped under Bayes, Rule Based, Neural network and Decision tree.

3.3.1 Naïve Bayes: Naïve Bayes theorem is the best machine learning algorithm to use when the features are independent of one another [12]. Each instance is considered as a vector. The posterior probability of a class given a predictor is found with

P(h|d) = (P(d|h) * P(h)) / P(d)

P(d|h) - the posterior probability of class given a predictor

P(h) - Prior probability of a class

P(d) - Prior probability of a predictor

3.3.2 Decision Tree: Decision tree is arrived at by finding the optimum way to arrange the various nodes. There are two ways to identify the best partition of dataset at node, information gain or gain ratio. The decision tree model which uses information gain is ID3 and gain ratio is J48 [13]

3.3.3 Multilayer Perceptron: Multilayer perceptron contains large number of nodes called as neurons, joined together so that they for input layer hidden layer and output layer. The instances are supplied though the input layer, bias and weight are added at the hidden layer and supplies the class in output layer [14].

3.4 Pattern Evaluation

After machine learning more than model will result. Evaluation of which model is a better model, is performed.

EXPERIMENTATION AND RESULTS

4.1. Dataset

Dress dataset was downloaded from UCI repository. The dataset contained 501 instance and 27 attributes. The attribute of dresses were: style, price, rating, size, season, neckline, sleeve length, waist line, material, fabric type, decoration, pattern type and recommendation. Each instance is information of a type of dress and whether customer buy the dress.

Following model used to identify weak students and propose improvement strategy for them (see Fig.1):

1. Association mining to find strong association rules
2. Feature Selection
3. Resampling
4. Classification
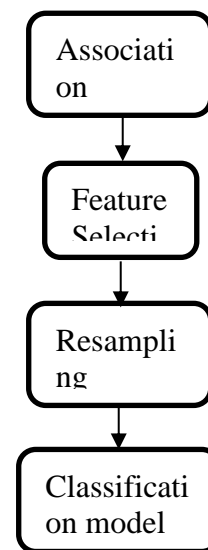
Fig.1 Block diagram of proposed model

4.2. Data preprocessing

All the attributes of dataset are nominal except ratings, the rating can also be converted to nominal dataset using Discretization process. Equal width binning is used, the ratings are mapped among five bins. The rating takes a value from 0 to 5, therefore 5 bins are used.

4.3. Feature Extraction

Dataset under consideration is a nominal dataset. Association mining is used to find the relation among various attributes. When association mining was applied, it observed no rules were mined. Association rules which were extracted had a confidence of 80% or less.

Information Gain Attribute Evaluation was done along with Ranker, even this resulted in equal weightage for all the attributes. So, all the attributes of dress dataset were considered important though the algorithms.

Through Domain based analysis it was found that size of the garment does not contribute to fashion trend, so the attribute was removed.

4.4. Resampling

The dataset has equal proportion of sales and no sales data. It is not necessary to implement resampling to solve Class Imbalance. But improve the classification model resampling is applied. Genetic algorithm based SMOTE (Synthetic minority Oversampling technique) is used. SMOTE algorithm achieves resampling by creating samples which are altered version of minority class instances. Further the algorithm we have applied is Genetic algorithm. Here a crossover and mutation of original sample is done, so the resamples are not exact match of original samples. A main disadvantage of sampling is overfitting. Since samples are duplicate of already existing instance, the classification model tends to be overfitted. This is avoided in our paper using GASMOTE.

4.5. Classification

Dress prediction dataset is used to classify the dataset into whether the dress would be sold or not. This learned system would be able predict the sales of a dress given a set of dress features. The model is created with an interest that, if a fashion designer or a merchandiser provides the idea of a dress then it can predict if the dress is of interest to customers.

Many classification algorithms are available to do supervised learning. According to No Free Lunch theorem [15], it is not possible assure that one algorithm is better than another. So, we are analyzing the dataset through various classification algorithms like, Multi-layer perceptron, Random forest, Random tree, J48, Naïve Bayes, BayesNet and SMO.

Preprocessed and sampled dataset was run through the classification algorithm using 10 folds cross validation. The order in which the data are supplied to the algorithm can bias the output and alter the end results. To avoid this, 10 folds cross validation is used. In k fold cross validation, dataset is divided into k folds and each fold is used for testing at some part of the learning.

Table I. Accuracy metrics for various classifiers

Classifiers	Accuracy
Multilayer perceptron	83.6%
Random Forest	83%
Random tree	80%
SMO	69.2%
J48	63.4%
Simple KMeans	70%
Naïve Bayes	65.8
Bayes Net	68%

When we look at the accuracy Multilayer perceptron and Random forest is better model to classify fashion data.

CONCLUSION AND FUTURE WORK

The accuracy of various classification algorithm is analyzed, and a working prediction model is created. This research can be expanded in future. Through this research we can predict sales. Using cognitive data mining, it possible to identify if the features of the dress which when altered can increase the sales of a dress or influence a person to buy the dress.

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MoC++ Interpreter for the C++ Language

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ABSTRACT

MoC++ Interpreter is a novel project that directly executes source program/instructions written in C++ language without translating it into a machine code or object code. MoC++ maps input to output statement by statement, where each instruction is thoroughly checked for syntax and semantic errors. MoC++ is an efficient interpreter which has a well-developed error diagnostics system. MoC++ interpreter solves complicated real – world problems by abstracting constructing the problem mathematically. MoC++ interprets a source code that adheres to a particular language specification that is C++, and can interpret possibly thousand lines of code. MoC++ doesn't alter the meaning of the original instruction being interpreted.

Keywords: Interpreter, C++ Language, Design, Developers, Students

I. INTRODUCTION

MoC++ interpreter is a novel project that directly executes a source program/instruction written in C++ language without translating it into machine code or object code. MoC++ maps input to output statement by statement, where each instruction is thoroughly checked for syntax and semantic errors. MoC++ is an efficient interpreter which has a well-developed error diagnostics system.
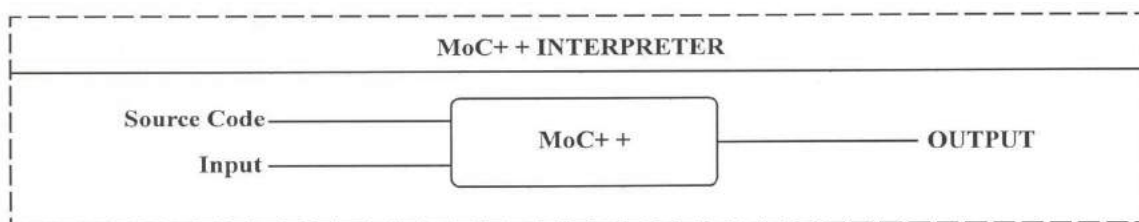
Figure 1: MoC++ Interpreter

MoC++ interpreter solves complicated real-world problems by abstracting constructing the problem mathematically. The mathematical modeling that MoC++ interpreter follows is:-

- Analyses a problem statement.
- Construct mathematical abstraction capturing key characteristics of the problem.
- Find an appropriate mathematical technique to provide a solution.

MoC++ interprets a source code that adheres to a particular language specification that is C++, and can interpret possibly thousand lines of code. MoC++ doesn't alter the meaning of the original instruction being interpreted.

The rest of the paper is organized as follows: Section 2 discusses about analysis and design, Section 3 is about the algorithm/pseudo code, Section 4 gives the conclusion.

II. ANALYSIS AND DESIGN

A. OBJECTIVES OF THE PROJECT

The goal of MoC++ interpreter is to translate a source program in a high-level language (C++) to the output directly without converting it into machine code. MoC++ Interpreter executes a source program statement by statement, outputs the solution in an easy to understand format, and provides an environment for efficient debugging of the program. MoC++ parses the source code and performs its behaviour directly. MoC++ implements self-modifying code hence it forms a base for artificial intelligence and machine learning research. MoC++ acts as an emulator for running computer software written for old languages which don't have a present day compiler to run source programs written in them.

III. ALGORITHM / PSUEDO CODE

A. CONCEPTUAL DESIGN

The conceptual design of MoC++ is a high level view of its software design and architecture. Conceptual design of MoC++ details regarding the primary components that make up the project. It includes the organization of the project and its interaction and interconnection with other components of the Mo C++ system. Conceptual design does not speak about the implementation technique of these components but provides a platform for thorough examination and understanding of the components. MoC++ consists of front end and back end functions. In the initial interpreting stage the front end of MoC++ helps in reading the source code. The primary components of MoC++ front end are the Source class, Scanner class, Token class, Parser class.

The Source class gets the file name from the user using the getfilename() and validates if the command and the file name entered by the user is correct. The Scanner class reads the source file or source program statement by statement using the get_token() and calls the extract_ token() to extract each token are divide the statement into several parts. The Token class returns the current token to the Parser class by using the current token of function.

The Parser class is the master that controls the entire translation process in the front end. It controls the entire process by owning the Token class, indirectly owning the Scanner class hence having indirect access to the Source class. The Parser class deciphers the token type and evaluates its characteristics by using the decipher() function. The result of the decipher()

Function determines whether the Parser class has to evaluate a key word using eval_key() function or evaluate an expression using the eval_exp() function. The Intermediate tier performs the second translation stage where the symbol table and the stack play an important role. This provides an interface for smooth, fast and efficient execution of the program at the Back End. The symbol table is generated using a SymbolTable class where createtable() function generates the initial template of the table. The variables and their values can be stored in the table with the insert() function, and their values updated using the update().

The search() function is used to search for a variable during expression evaluation. The stack is implemented using the Stack class. The stack data structure helps in expression evaluation. The Back end is the most important phase of an instruction execution where the interpreter evaluates, validates the instruction and outputs the result. The interpreter Back End consists of an executor which reads the symbol table and executes the source code.
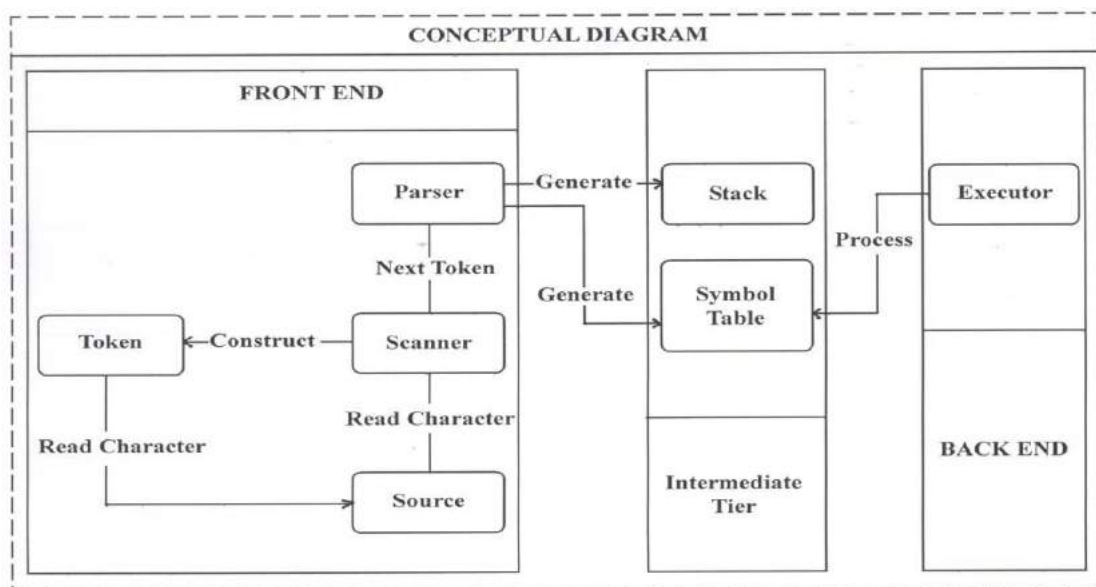
Figure 2: Conceptual Diagram

B. ALGORITHM

Step 1: Get the file name

Step 2: Read the file statement by statement till the end of the file. Step 3: Extract token by token from the read   statement

Step 4: Decipher the token extracted and identify the token type and take the appropriate action.

Step 5: If the extracted token is a keyword then evaluate the keyword accordingly

Step 6: If the extracted token is an expression then evaluate the expression using an appropriate function call

Step 7: Repeat the Steps 2 to 6 until the entire file is parsed.

C. CLASS DIAGRAM

Class diagram shows the relationship, interconnection and dependency of one class on another class.

MoC++ has six classes where one class inherits from another class using the Hybrid inheritance technique.
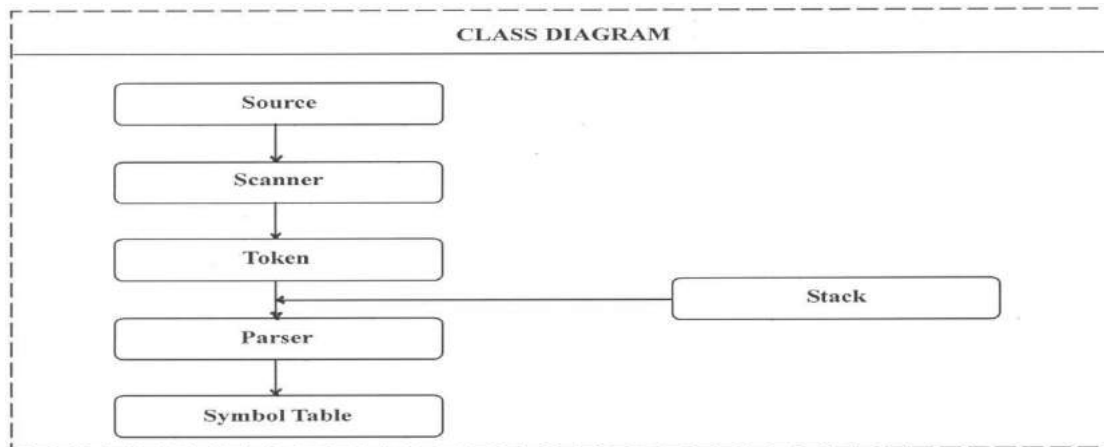
Figure 3: Class Diagram

IV. CONCLUSION

The goal of MoC++ is to translate a source program in a high-level language to the output directly without converting it into machine code. MoC++ provides the power of Python programming and Java programming in C++, where efficiency, garbage value collection, and many other best features of these programming languages are incorporated in it. MoC++ Interpreter executes a source program statement by statement, outputs the solution in an easy to understand format, and provides an environment for efficient debugging of the program. MoC++ parses the source code and performs its behaviour directly. MoC++ implements self-modifying code, hence, it forms a base for artificial intelligence and machine learning research. The abbreviation of MoC++ is derived from the first two letters of the name of the author of this unique interpreter: Moni Krithika. The author authoritatively works on C++, the generally accepted and implemented Computer Language; and hence the name MoC++, is most suitable for this interpreter program. This interpreter is being developed further for its higher accuracy for debugging, superior reading capacity and other valuable and user-friendly features.

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Image Organization Using Unsupervised Deep Learning - Case Study

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ABSTRACT

Now a day's, the intelligent machines were created that works like a human is an artificial intelligence. Intelligent machines were trained with qualities such as, knowledge, reasoning, problem solving, learning, planning etc. These training of machines with various models is machine learning. Sub domain of a machine learning is deep learning method, in which computer models are trained to perform classification tasks directly from pictures, text or voice. Deep learning models can attain high accuracy, may be beyond human performance. Models are trained with large data sets & neural network architecture with several hidden levels. In a supervised deep learning, we tell machine what to do and what not to do using an algorithm. Since we are instructing machine what not to do, the machine is having limitations to solve the problem. To solve this issue, an unsupervised deep learning algorithms are used, which derive insights directly from data and that can be used to make decisions on data.

Keywords : Machine Learning, Neural Network, Deep Learning, Intelligent Machine, Unsupervised Learning

I. INTRODUCTION

Machine learning is giving computers the capability to learn without programming to it. It is the ability to learn by the machine. Automating the learning process of computers depends upon their experiences without any human support. The process of automating the machine through machine learning begins with feeding a quality data with algorithm and training the computers by building machine learning models. It is a set of assumptions about the actual nature of data to be trained. The model is used as the source for determining what a Machine Learning algorithm should learn[1],[10],[11]. A good model, which makes accurate assumptions about the data, is necessary for the machine to give good results.

Among the various types of ML techniques, a essential difference is drawn between supervised and unsupervised learning:

- Supervised machine learning: "Train" the program on a pre-defined set of "known data", which then assist the program to reach an precise result when new data is given.
- Unsupervised machine learning: A collection of data is given to the program and it should discover patterns and relations therein.

II. SUPERVISED MACHINE LEARNING

In many of supervised learning applications, the decisive objective is to develop a well performed hypothesis function h(x) (called as predictor

function). "Learning" consists of using well defined mathematical algorithms to optimize this function so that, given input data x about a certain domain (say, date of a picture),[2] it will precisely identify some interesting value h(x) (say, location of the picture).

In practice, x almost always represents multiple data points. So, for example, a location of a picture predictor might take not only date of a picture (x1) but also Time of picture taken(x2), number of pictures taken (x3), solo or group picture(x4)and so forth. Predicting which input data to use is an vital part of ML design. However, for the sake of explanation, it is easiest to assume a single input value is used.

So let's consider simple predictor which has this form:

$$h(x) = \theta_0 + \theta_1$$

where θ_0 and θ_1 are constants. Our goal is finding the appropriate values of θ_0 and θ_1 to make our predictor work as well as possible.

Training examples are used to optimize predictor h (x). For every training example, There is an input value(x_t) and its corresponding output, y, is known in advance. For each example, we find the difference between the known, correct value y, and our predicted value h(x_t). With the sufficient training data examples, these differences give us a useful way to compute the "erroneousness" of h(x). We can then catch h(x) by tuning the values of θ_0 and θ_1 to make it "less wrong". This process is repeated over and over until the system has converged on the best values for θ_0 and θ_1. By this process, the predictor gets taught, and become ready to proceed some real-world prediction.
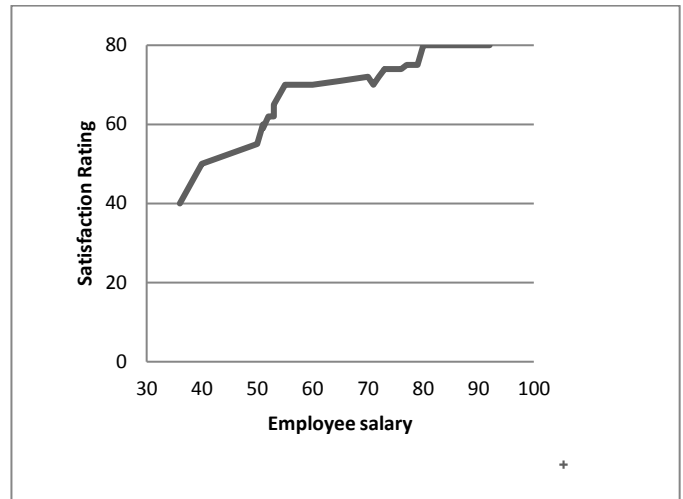
In the above illustration, employee satisfaction is represented with respect to salary and satisfaction rating. A simple problem is considered for the purpose of illustration, but the problems are much more complex in the real world , that's the reason ML exists. Here a two dimensional data representation is illustrated. we can draw a picture of, maximum, a three-dimensional data set, but in general, ML problems focussing on data with plenty of dimensional factors, and much complex predicting functions[3]. The problems that are complex to solve by numerical procedures can be solved by machine learning methods. The objective of ML is not only to make "accurate" estimations, because ML deals in area of computer science where no such concept is adopted. The primary objective of machine learning is to perform guesses that are perfect to use.
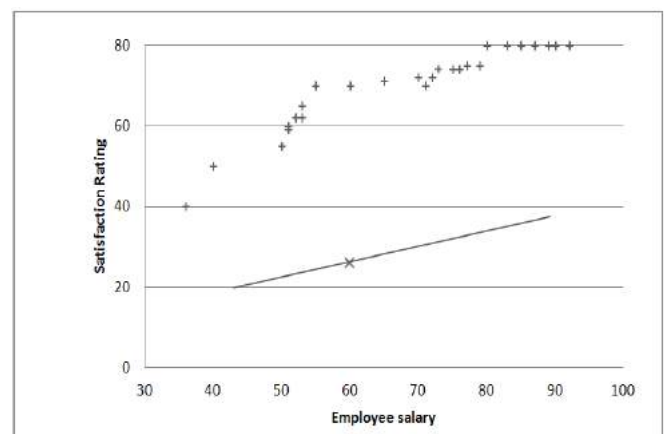
The predictor would produce employee satisfaction rate 25 if the predictor is asked for the satisfaction of employee earns 60k. If we perform a little modification as a mathematical magic, we can

calculate, with very high conviction, that values θ_0 and θ_1 are going to give us a efficient predictor function.

A. Algorithms used for supervised machine learning –

- Nearest Neighbor
- Naive Bayes
- Decision Trees
- Linear Regression
- Support Vector Machines (SVM)
- Neural Networks

III. UNSUPERVISED MACHINE LEARNING

In unsupervised machine learning, the computer is trained with unlabeled data to identify the patterns of the data. No need of instructor in this case, the computer can be able to teach us new things after the pattern of data is learnt by the machine. this is useful when human does not know what to look in the data. unsupervised machine learning uses pattern detection and descriptive modeling[9],[12]. These algorithms use learning methods on the input to discover rules, patterns and cluster the data sets which help deriving meaningful insights.

A. Algorithms used for unsupervised machine learning –

- k-means clustering, Association Rules

B. How to Organize a Photo Gallery using unsupervised machine learning?–

I have 1500+ photos in my Smartphone right now. If I had been a selfie freak, the photo count would easily be 10 times more. Sifting through these photos is a nightmare, because every fifth photo turns out to be unnecessary and useless for me.

To get a clearer perspective of the problem[5], I went through my mobile and tried to identify the categories of the images by myself. Here are the insights I gathered:

one third of my photo gallery is filled with circulars/notifications from my office. I would like to collect images of motivational and interesting quotes. There are at least 300 images I captured, or shared by my colleagues and group pictures. There are few images/screenshots for my reference that has to be purged after use. There were numerous "good morning", "happy birthday" and "festival greetings" pictures that I desperately want to delete from my gallery. How much I exterminate them, they just keep coming back.

In this scenario, better ways can be adopted to organize photos using automated algorithm in such a way to access them in less time[4].

IV. APPROACHES TO ORGANIZE PHOTOS IN SMART DEVICES

A. Approach 1 - Arrange on the basis of important date

New Album   Me
             1 item

Sha Anniversary   Brother's wedding
1 item   52 item . shared

This is the simplest way to arrange the photos based on important dates say birthday, anniversary etc. It is quite easy to search photos based on date.

B. Approach 2 - Arrange on the basis of time

143

The simplest way is to arrange the photos on the basis of time. Each day different folders can be created. Typically most of the photo viewing applications use this approach.

C. Approach 3 - Arrange on the basis of location

This way of arranging photos is good because if the photos are maintained based on the location that have been visited by us. If the GPS location of the smart device is turned on, then this approach can scrutinize the photos and organize more often &rapidly.

D. Approach 4 - Arrange on the basis of the image received through group

We are in the modern world where we are controlled by machines in one extreme. Social media are playing a vital role and that became medium of communication for us. the best example is whatapp group. Any corporate or academic individual could be a part of at least 5 whatsapp groups which is only for information sharing & communication. At this scenario, if the images are clustered according to the group through which group it come from[6].

E. Approach 5 - Extract Semantic meaning from the image and use it to define image collection

These approaches were mostly dependent on the metadata that is captured along with the image[7]. A better way to organize the photos would be to extract semantic information from the image itself and use that information intelligently.

Suppose there are similar variety of photos. What trends should the algorithm capture?

1. Is the captured image of a natural scene or is it an artificially generated image?[8]
2. Is there textual material in the photograph? If there is – can we identify what it is?
3. What are the different kinds of objects present in the photograph? Do they combine to define the aesthetics of the image?
4. Are there people present in the photograph? Can we recognize them?

Are there similar images on the web which can help us identify the context of the image?

So the algorithm should ideally capture this information without explicitly tagging what is present and what is not, and use it to organize and segment our photos. Ideally, the final organized app could look like this:

This approach is called "unsupervised way" to solve problems. The expected outcome is not directly defined. Instead, the algorithm is trained to find those outcomes for us! This algorithm summarizes the data in an intelligent manner, and then tries to solve the problem on the basis of these inferences.

V.CONCLUSION

Deep learning focuses on various dimensions of given data. unsupervised deep learning extracts the characteristics of these data and cluster them according to similarity of data. If a teacher teaches a concept to a student then other set of students can learn from that one student whom taught by a teacher which does not require any supervisor(Teacher). In photo gallery organization, similarity between the images based on their basic semantics, images can be clustered. These clusters can be used to generate automatic algorithm which would be trained to organize photo gallery effectively. So, the algorithm is trained with semantic data model and not the machine. As a conclusion, unsupervised deep learning to solve a problem can be efficient with respect to time complexity and produce high performance.

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Study of Fluorescence Quenching of Coumarin Dye by Dimethyl Aniline In Binary Solvent Mixtures - A negative deviation

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ABSTRACT

Coumarin derivatives are extensively investigated in terms of their photo physical properties to understand excited state in regard to understand and innovate molecules. In this article we study steady state quenching of fluorescence of a coumarin derivative namely 3-Hydroxy-3-[2-oxo-2-(3-oxo-3H-benzo[f]chromen-2-yl)-ethyl]-1,3-dihydro-indol-2-one (3HBCD) in binary mixture of acetonitrile and 1,4 dioxane. Dimethylaniline is used as quencher. A negative deviation is seen with modest quencher concentration in the Stern-Volmer (S-V) plots. The quenching ability of Dimethylaniline in reference to aniline is more due to its higher ionization energies.

Keywords : Fluorescence Quenching; Negative deviation; Coumarin derivatives; solvent mixtures.

I. INTRODUCTION

Coumarin and its derivatives have been well famous for their anti-tumor [1-2], anti-coagulant, anti-viral, anti-oxidant, anti-inflammatory vaso relaxant [3-4], anti-microbial [5] and enzyme inhibition properties [6-9]. These compounds are specifically known to exert an anti-tumor effect and can cause significant changes in the regulation of the immune response, cell growth and differentiation [10]. Various fields like biology, medicine and electronics utilizes Coumarins are widely used due to their high fluorescence overall response. Solvent polarity, solvent viscosity and pH of the solution greatly affect fluorescence properties of coumarin as revealed by studies [11-16]. Fluorescence quenching play a sensory role by molecular identification which serves numerous categories of beneficiary including biology as well as chemical analysis. In biochemistry, fluorescence quenching has been used for a) investigation of accessibility and localization of probes in a membrane or protein [17-19] b) analyzing accessibility of fluorophores to quenchers c) detecting presence of multiple emitting species and many more. Many investigators found interest towards florescence quenching due tremendous novel application [12, 13, 27-30]. Fascinating applications and properties of coumarins and bioanalytical applications of fluorescence quenching inspired us for the present investigation.

In present work, 3HBCD is investigated for its quenching interaction with aromatic amine Dimethylaniline as external quencher. Effect of solvent polarity and viscosity is analysed by doing quenching analysis different solvent mixtures of acetonitrile and 1, 4-dioxane at room temperature.

Negative deviation in S-V plot is observed in all solvent.

II. THEORY

Among various reasons fluorescence quenching of a sample externally added molecule called quencher gives immense information on surrounding medium.

Static quenching (contact quenching), dynamic quenching (collisional quenching) and Fluorescence Resonance Energy Transfer are three main quenching mechanisms that are caused by external molecule. Both of static and dynamic quenching processes are explained

using Stern-Volmer (S-V) equation and Stern-Volmer plots (S-V plots). The fluorescence intensities before (I_0) and after (I) adding quencher are related as

$$I_0/I = 1 + K_{SV}[Q] \qquad (1)$$

Here K_{SV} is known as S-V constant. Among linear and positive deviations in S-V plots some of the researchers have also reported a negative deviation in S-V plots (downward curvature) [18-22]. Many Reasons such as heterogeneity of the system, selective quenching, hydrogen bond complex formation, occurrence of reversible photochemical process etc are recognized for the negative deviation [18]. Quenching data arising due to one of these reasons may be analyzed using linear form Lehrer equation [20] given below.

$$I_0/\Delta I = 1/f + 1/(f\, K_{SV}\, [Q]) \qquad (2)$$

Here $\Delta I = I_0 - I$. A plot of $I_0/\Delta I$ versus $1/[Q]$ is linear with $1/f$ as intercept and K_{SV} = intercept/slope. Negative deviation in S-V plot is inspected using above mentioned equations. f is the fraction of accessible fluorophores.

III. EXPERIMENTAL DETAILS

3HBCD is synthesized by standard methods [23,24] whose molecular structure is as shown in fig.1.
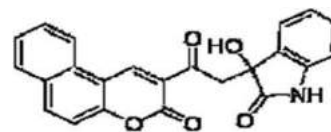
Fig 1: Molecular structure of 3HBCD

The doubly distilled aromatic amine Dimethylaniline is used as quencher. Spectroscopic grade solvents are obtained from S-D-Fines Chemicals Ltd., India. Sample concentration is kept at 1 x10^{-5} M. Mole concentration of quencher is varied from 0.00M – 0.10M for the solution prepared. Absorption spectra are measured at room temperature using double beam UV-VIS Spectrophotometer (Model: Shimadzu UV-1800) where maximum absorbance is found to be 389 nm and the same is used as excitation wavelength. The fluorescence spectra are recorded using fluorescence spectrophotometer (Model: Hitachi F-2700) by keeping operating voltage 400V and the slit width at 5nm. Typical emission spectra of the sample in 20% 1, 4dioxane + 80% acetonitrile without and with different quencher concentrations are shown in fig. 2.
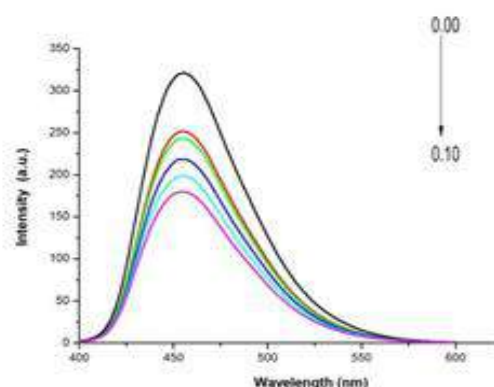
Fig 2: Emission spectra at 20% DX+ 80% CAN for fixed concentration of 1×10^{-5} M with varying quencher concentration of Dimethylaniline

Fluorescence lifetimes (τ0) measurement facility is availed at IISc, Bangalore using Photo physics model of TCSPC nanosecond fluorescence spectrometer HORIBA FLUOROLOG. Lifetime is measured without quencher by exciting the at 389nm.

IV. RESULT ANALYSIS

The fluorescence quenching study is ACN and 1,4DX at room temperature. External quencher Dimethylaniline (DMA) is added. Quenching data is analysed by the most convenient and reliable method i.e., by plotting S-V plots [9-22] using equation (1) and is shown in fig3.

The plots are almost linear in the lower concentration range and at higher quencher concentration (0.06-0.10M), show deviation towards x-axis with unity as intercept. The quenching data related to negative deviation S-V graph is handled by using equation (3) and modified S-V plots are presented as in fig.4.
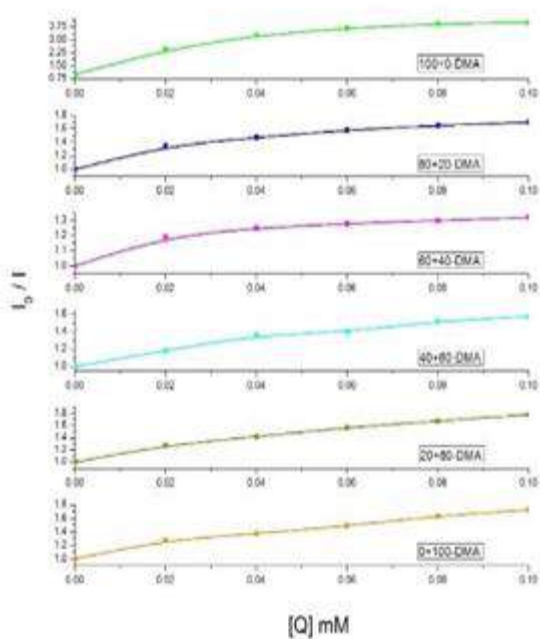
Fig 3: Stern–Volmer plots exhibiting negative deviation in different solvent mixtures
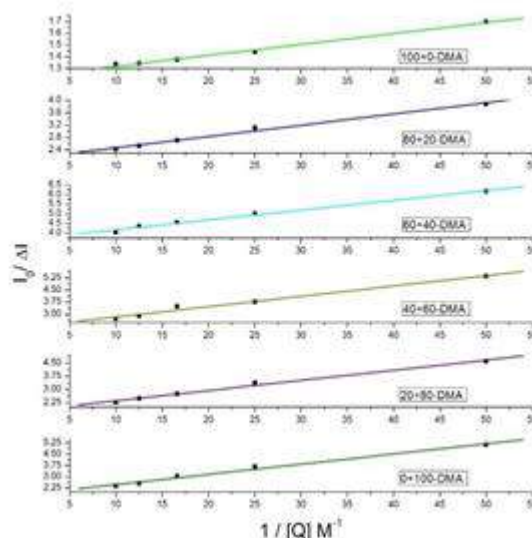
Fig 4: Modified linear Stern–Volmer plots of I0/(I0 –I) versus 1/[Q] in different solvent mixtures with Dimethylaniline

The obtained straight line plots has with f^{-1} as intercept where f lies between 0 and 1 (0≤ f ≤1) and ^{LH}KSV= intercept/slope.

The bimolecular quenching rate parameters kq was determined with the substitution of the experimentally measured values of ^{LH}KSV and τ0 in the relation kq= ^{LH}KSV/ τ0 (Table 1). From the plots I0/I versus [Q] (i.e. for lower quencher concentration region a linear plot is made) we have calculated S-V constant ^{LH}KSV to analyse different quenching parameters to categorize the quenching mechanism. These values are also tabulated in Table 1.

Overall static quenching is ruled out due to no changes in absorption and emission spectrum of the fluorophore upon addition of quencher and since values ^{LSV}KSV measured from the linear fit are relatively small compared to ^{LH}KSV (Table 1).

A negative deviation in S-V Plots showed at higher concentrations (from 0.06M to 0.1M) of quencher can be due to the occurrence of a reverse reaction in the photochemical process or the existence of two fluorophores with different accessibility to quencher. photochemical process is ruled out as no new

fluorescence emission band is observed on adding quencher into the mixture solutions of 3HBCD. Hence negative deviation in Fig. 3 would be due to the presence of 3HBCD in two different conformers. It can proposed that 3HBCD occurs in possibly two different conformers which are accessible for fluorescence quenching in different fractions. Conformer (I) may be due to possibility of intra-molecular hydrogen bonding between the hydrogen atom of hydroxyl group and oxygen atom of the carbonyl group (as shown in Shcme-1). Conformer (II) exists due to inter -molecular hydrogen bonding between −OH group of one coumarin molecule with lactam −NH group of the other coumarin molecule as shown in Scheme-2. Here one of fractions of accessible fluorophores is assumed be conformer (I) due its highest stability[18].

Table 1: Quenching parameters of 3HBCD in solvent mixtures of ACN and DX with fraction of accessible fluorophores (f), S-V constant (KSV), bimolecular quenching rate parameter (kq) and diffusion rate constant (kd)

Solvents	Viscosity η (cP)	Dielectric constant ε	Life time τ (ns)	f	$^{LH}K_{SV}$ (M^{-1})	$^{LSV}K_{SV}$ (M^{-1})	kq 10^9 (M^{-1}s^{-1})	kd 10^9 (M^{-1}s^{-1})
100% Acetonitrile (ACN)	0.34	36	0.35	0.55	26.7	9.35	74.51	31.34
20(DX)+80(ACN)	0.34	29.22	0.40	0.56	30.95	9.5	75.56	30.41
40(DX)+60(ACN)	0.40	22.44	0.62	0.45	34.76	9.02	55.94	26.2
60(DX)+40(ACN)	0.53	15.66	0.61	0.47	58.3	11.8	94.64	20.2
80(DX)+20(ACN)	0.77	8.88	0.73	0.27	71.5	6.22	97.57	10.8
100% 1,4 Dioxane (DX)	1.17	2.1	1.11	0.81	132.1	56.6	118.3	9.11
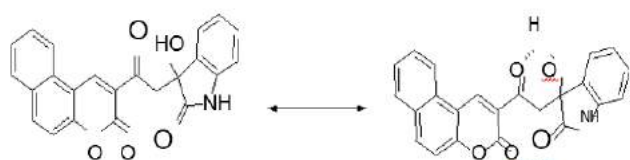
Scheme-1: Intra-molecular hydrogen bonding formation.
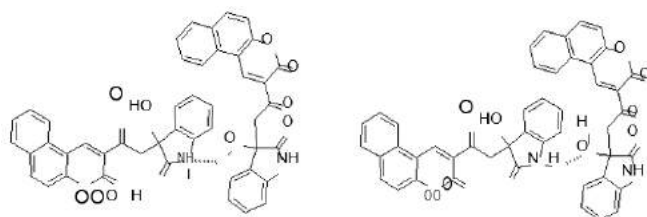
Scheme-2: Inter molecular hydrogen bonding formation between −OH group and −NH group.

By plotting the data according to equation (3) it is observed that S-V constant varies from 26.70 M^{-1} to 132.10 M^{-1} (Table1). Also from fig 4, intercept yields fraction of accessible fluorophore f (i,e. for one of the conformer of 3HBCD) to be < 1 which suggests that both the conformers are partially available for quenching. S-V constant obtained in our previous paper [18] by using aniline as quencher, it is found to be less than the values obtained by using dimethylaniline. Hence the quenching ability of Dimethylaniline in reference to aniline is more due to its higher ionization energies.

The high values suggest efficient quenching of fluorescence. Evaluated values of kd using the formula

$$kd = 4\pi N' DR \qquad (5)$$

is made according to standard procedure and are tabulated in Table 1. Viscosities of the solvent mixtures are obtained from literature [25].

As seen here values of kq is greater than kd suggesting diffusion limited reaction. But from fig 5 ^{LH}KSV is found to be increasing with the increase in viscosity of solvent mixture. Hence it can be inferred

from Inverse dependency of kd on viscosity of the solvents, that quenching is not merely controlled by material diffusion [20]. The value of $^{LH}K_{SV}$ inversely dependent on dielectric constant of the medium. A plot of ^{LH}KSV vs. ε is obtained as in fig 6 which may suggest that the reacting species are of opposite charge. With decrease in acetonitrile percentage in the medium dielectric constant decreases, which destabilizes the re-acting species, and increases the reactivity and the rate of the reaction is enhanced [26].
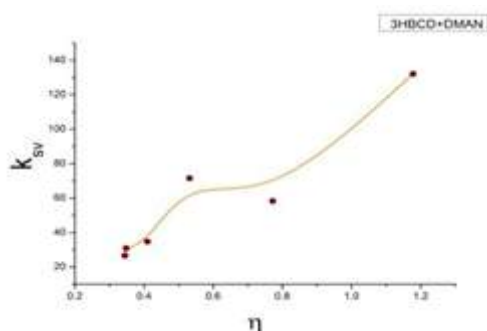
Fig 5: Plot of S-V constant ^{LH}KSV mixtures viscosity
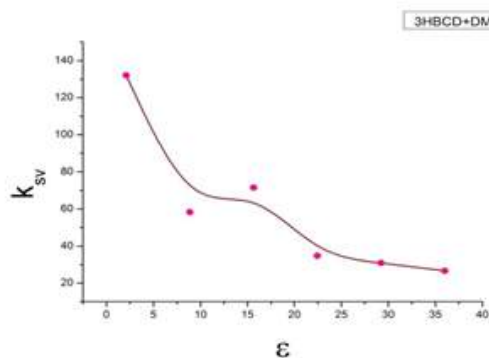
Fig 6: Plot of S-V constant ^{LH}KSV constant of solvent mixtures

V. CONCLUSIONS:

Aprotic binary mixtures are used to study fluorescence quenching mechanism of 3HBCD, using Lehrer equations. Aromatic amine Dimethylaniline is used as external quencher.

Large value for bimolecular quenching rate is obtained representing high quenching efficiency.

With the increase in solvent viscosity diffusion limited rate constant decreases representing that dynamic quenching is not strictly controlled by material diffusion.

Quenching ability of Dimethylaniline in reference to aniline is more due to its higher ionization energies. The presence of 3HBCD in two ground-state conformers due to intermolecular and intra-molecular hydrogen bonding is indicated by negative deviation from the normal Stern–Volmer relationship.

Overall quenching of the fluorescence of 3HBCD is affected considerably by solvent polarity, viscosity of the media and ionization energies of quencher.

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A Survey on Applications of Attribute Based Encryption in Various Networks

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ABSTRACT

We collect various information's by using several sources and use different types of networks to share the gathered information's, the cloud networks is used to share the information to the larger audience over an internet, the delay tolerant networks is used to share the information over the adhoc networks, the fog computing network is used to share the information to the devices residing at the edge of network. The security and privacy issues of those networks are the great concerns among the researchers. The Attribute Based Encryption has been the most promising cryptographical approach for the decades to secure the data in transit and storage in the above mentioned networks. In this paper we survey the applications of attribute based encryption and their security requirements and performance measurement evaluation methods in the above mentioned networks.

Keywords : Adhoc Networks, Cryptographical Approach

I. INTRODUCTION

In the age of information, the information are collected by the means various means such as camera, text, and sensors. When the owner of the information retains the information with himself in a local storage like desktop, flash drives and hard disks, the data is secured. On the other hand when it is transmitted to the other user over the networks it is stored either in terminal node or in an intermediate node or in various nodes, the node consists of servers and networking devices, when the data is stored in the cloud in the plain format, it is very much vulnerable to the attack of the hackers and other malicious software programs, thus the privacy of the user data is under threat [1] [2] [3] [4]. Hence in order to secure the data when it is in cloud and transit, the data need to be encrypted by means of

cryptographical methods[5]. This paper surveys the applications of attribute based encryption [6] presented by Amit sahai and Brent waters in various networks and the security parameters to measure the performance of the implementations.

A.Attribute based encryption

One of the most widely used encryption scheme to implement the data centric security is to use attribute based encryption [7] [8], this is a public key encryption, in this the user attributes (eg: role, position, designation) are used to construct a cipher text and secret key. Hence only the user key that matches with the described attributes in the cipher text can decrypt the data.

The major two types of ABE schemes are Key-policy ABE (KP-ABE) [6] and Ciphertext-policy ABE (CP-

ABE)[9], in KP-ABE the owner uses the set of attributes to construct a ciphertext and the private keys are mapped with an access structure. The access structure specifies which type of ciphertext the private keys can decrypt. In CP-ABE the owner uses the user attributes to construct a secret key and access structure is used to construct a ciphertext.

Background

In this section we give the background operational details of ABE. the ABE allows monotonic or non-monotonic access structure [10] [11] . This scheme uses four algorithms as explained in the following table.

Table 1 : Attribute Based Encryption Algorithms

Algorithm	KP –ABE		CP-ABE	
	Input	Output	Input	Output
Setup	Security Parameter	Public Key Master Key	Security Parameter	Public Key Master Key
Encryption	Public Key Message Set of Attributes	Ciphertext	Public Key Message Access structure	Ciphertext
Key Generation	Access structure Public Key Master Key	Private Key	Set of Attributes Public Key Master Key	Private Key
Decryption	Public Key Ciphertext	Message	Public Key Ciphertext	Message

Applications of Attribute Based Encryption

In this section we discuss the implementation of Attribute Based Encryption in various networks with its application details.

1. Secure Data Exchange in Cloud Networks

One of the major applications is preserving personal health records in cloud networks. It is very important to maintain privacy of the personal health records in cloud storage [12] [13]. Ming Li et al [14] have proposed and implemented a frame work as shown in figure 1[14] for secure sharing of personal health records using attribute based encryption. It uses multi authority ABE to improve the security and reduce key-escrow problem in the public domain. This frame work assumed that the server is semi-trusted. The requirements of its implementations are data confidentiality: the unauthorized people should be denied access to the personal health document. On-demand revocation: when an attributes of the user are not valid, an access should be denied. Write-access control: authorized user should not be allowed to modify the record contents. Scalability: as there will be an unpredictable number of users in the public domain the system should allow access to everyone at anytime. It divides the public domain into two groups as public and private domains, for public domain multi authority ABE is used and for a private domain and KP-ABE is used to manage the secret keys and rights to access the data. This frame work also implements break -class access in the case of emergency by overriding a regular access policies.
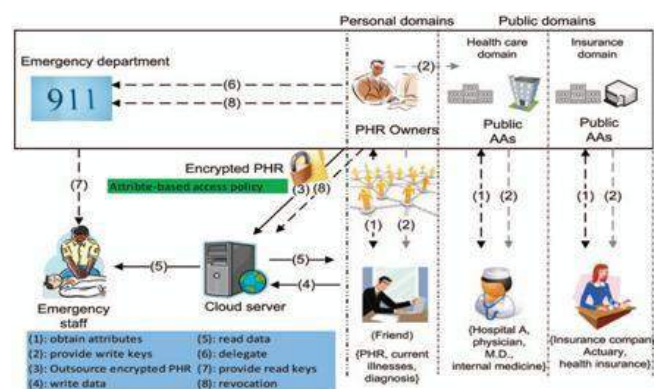
Figure 1: A secure patient- centric framework for cloud networks

Kai fan at al [15] proposed another similar framework for securing personal health records. This scheme uses Key-Aggregate Encryption (KAE) in the private domain and MA-ABE in a public domain.

2. Secure PIN Sharing in Delay Tolerant Networks

The delay tolerant networking is method of computer network that is used to solve the technical problem in heterogeneous networks that does not has continuous network connection between source and destination [16], the DTN uses the store-and-forward approach hence the nodes that stores the data are not fully trusted, and a third part may access the data easily [17]. Amang and Toru [18] designed a framework shown in figure 2[18] to securely exchange a data in the wireless Delay Tolerant Network (DTN), This framework uses ABE to distribute the secret key for symmetric encryption and message authentication to the authorized nodes.
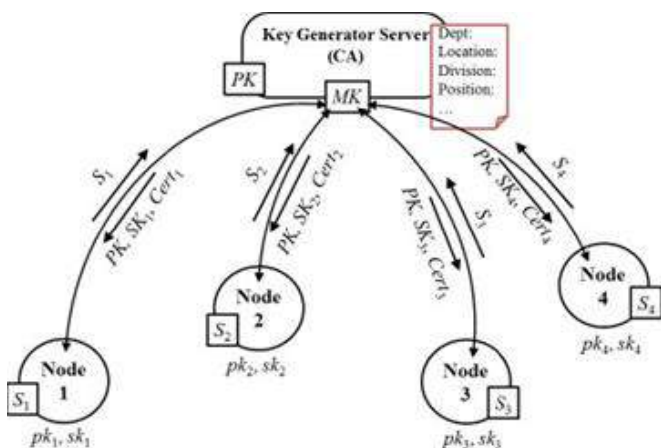
Figure 2 : A secure pin sharing framework for in Delay Tolerant Networks

Hyunsoo, Daeyeong, Changhee and Junbeom [19] proposed device to device (D2D) protocols and they have exploited the CP-ABE to securely communicate the initial key for establishing connection, in order to prevent man-in-the middle attack or replay attack.

3. Secure Key Sharing in Fog Computing

The fog provides extension to the counter in a way it brings the cloud closer to things that are connected to internet, any devices with a computing, network connectivity and storage is a fog node[20] [21]. Arwa et al [22] have proposed and implemented a secure key sharing framework based on CP-ABE in order to achieve confidentiality, authentication, verifiability and access
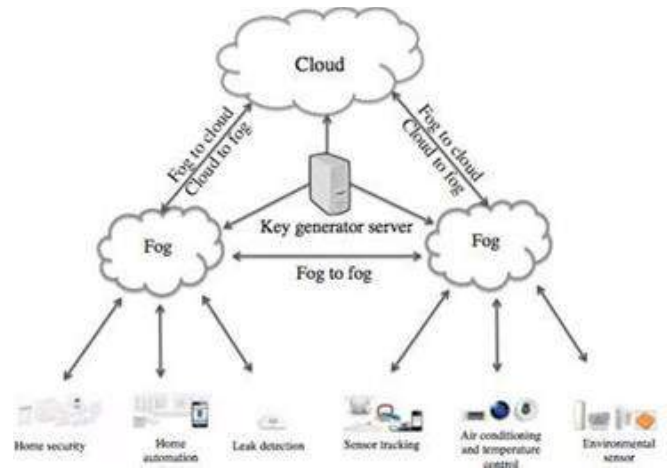
Figure 3: A secure pin sharing framework for Fog Computing

control in fog computing. Their proposed implementation is shown in figure 3. The key generation server generates and distributes the keys among the participating nodes. The cloud provides the access structure and encrypts the data to get cipher text. This method uses digital signature and CP-ABE to reach the security goals. The authors have analyzed their implementations with the certificate based scheme.

Table 2 : Comparison of ABE implementation in various networks

Networks	ABE Primitives	Security Goals	Performance analysis
Cloud Networks	KP- ABE CP-ABE	Data confidentiality On demand revocation Write access control Break glass approach Authentication Authorization	Space complexity Time Complexity
DT Networks	KP-ABE CP-ABE	Confidentiality of routing messages Integrity of routing messages Confidentiality of content data Integrity of content data	Computation cost Storage cost Communication Cost
Fog Network	KP-ABE CP-ABE	Confidentiality Access control Authentication verifiability	Message Size Communication Overhead Comparison

As illustrated in the table 1, the safety requirements for the implementation of ABE remain almost same for all the networks. The primary focus in all of the implementations is confidentiality of messages, access control and authenticity. The performances of the implementations are measured in terms of space complexity, time complexity, computation cost, storage cost, and message size.

II. Conclusion

In this paper, we have conducted a survey on implementation of Attribute Based Encryption in various networks. It is more evident that the Attribute Based Encryption is being a most promising cryptographic based security implementation is highly flexible and it can be implemented to design a framework for any secure network which involves data communication, storage, and computing.

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Optimal Design of Power System Stabilizer Based on Flower Pollination Algorithm

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ABSTRACT

The Power System Stabilizer (PSS) is a controller, which is used to mitigate the instability of Low Frequency Oscillations (LFOs) in power systems. The condition of oscillatory instability can also cause the loss of generator synchronism. It is observed that the damping provided by PSS depends on the proper selection of its parameters. This paper presents the systematic method for the selection of PSS parameters using evolutionary nature inspired optimization technique called Flower Pollination Algorithm (FPA). FPA is employed for selecting the optimal parameters of PSS so as to mitigate the low frequency oscillations of generator rotor and thereby oscillatory instability. The system consists of Single Machine with PSS which is connected to Infinite Bus (SMIB) through a transmission line. The transient simulation validates the performance of the system with optimized PSS. The results show that PSS with FPA optimized parameters provides fast and stable response.

Keywords: Power System Stabilizer (PSS), Low Frequency Oscillations (LFOs), Flower Pollination Algorithm (FPA).

I. INTRODUCTION

The modern power systems with a long transmission lines are critically affected by low frequency oscillations particularly under stressed condition with random high load fluctuations. The occurrence of load fluctuations can initiate the swinging of generator rotor and hence low frequency oscillations originate. The ever present random load fluctuations can cause an adverse harmful effect on the rotor oscillations. If the damping of the system is not adequate (even if negative) then the adverse effect is shown in the long transmission line which threatens the power system stability and also the longevity. Hence, it is noteworthy that damping of the system has to be improved in the low frequency range. PSS is the supplementary controller in the excitation system which helps to mitigate the problems of LFOs. It is a cost effective and satisfactory solution [1], [2]. There exists a considerable literature on the design of PSS to mitigate the LFOs and to enhance the system stability. The advantages of NN tuned Fuzzy Logic (FL) based PSS are simplification in learning capability and high computational speed. In [6], Bat Algorithm (BA) based PID-PSS is presented. The PID-PSS parameters are optimized using BA.

The tuning of PSS parameters by using a recently proposed algorithm called Oppositional Gravitational Search Algorithm (OGSA) is done in [7], which is used to mitigate LFOs and improve dynamic

stability of the system. The design of PSS based on Genetic Algorithm (GA) is reported in [8], which is used to suppress the rotor oscillations, enhance the settling time and overshoot. The optimization of PSS parameters using Particle Swarm Optimization (PSO), Bacterial Foraging Algorithm (BFA) and Gravitational Search Algorithm (GSA) is reported in [9], [10] and [11] respectively. The above stated optimization techniques have some drawbacks, such as consume more computational time, complexity, encoded parameters requires more capacity and results with less accuracy. The best features of FPA are the global survey and local manipulation in the same iteration and randomness in every iteration by way of abiotic pollination. In this paper, a systematic selection of PSS parameters using flower pollination algorithm is presented. The objective of this paper is to improve the system stability and optimize the PSS parameters using FPA. The performance of the system with optimized PSS parameters is validated through the transient simulation under large disturbance. The sections of this paper are organized as follows. The modelling of the power system is presented in Section 2. The design of PSS is explained in Section 3. The results and discussion are described in Section 4. At last, the conclusion is presented in Section 5.

II. Modelling of the Power System:

The power system model schematic diagram is shown in Figure 1. It includes synchronous generator, PSS, automatic voltage regulator, transformer, transmission line and infinite bus. The resistance and reactance of the transmission line are denoted by Re and Xe respectively. The AVR and the excitation system are used for the controlling the terminal voltage of the synchronous generator which is indicated by Vt.
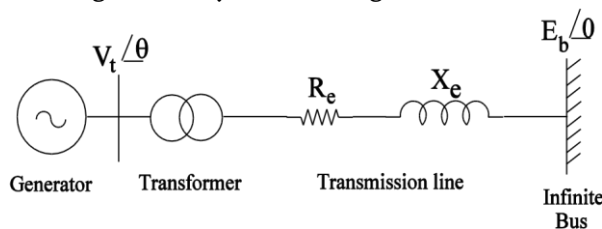
Fig. 1: Structure of Power System Model [1]

Structure of Power System Stabilizer:

The purpose of PSS is to enhance the damping torque so has to overcome the negative damping provided by high gain, fast acting excitation system. The suitable input signal of PSS for this purpose is the generator speed deviation signal [1], [2]. The structure of PSS is shown in Figure 2.
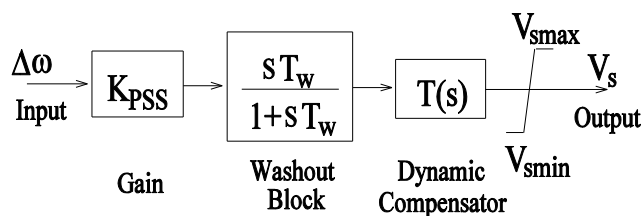
Fig. 2: Structure of Power System Stabilizer [1]

The PSS primarily consists of four blocks namely: gain, washout block, dynamic compensator and torsional filter. The torsional filter is not considered here. The output of PSS (V_s) is given to the AVR as an input signal.

1) **Gain:** The damping of low frequency oscillations, which corresponds to swing mode, depends on the gain (K_{PSS}) of PSS. Hence, the optimal value of gain must be chosen so has to obtain the maximum damping of swing mode.

2) **Washout Block:** The output signal of PSS may contain steady state bias. In order to remove the steady state bias, the high-pass filter is used in PSS, which is called as washout block.

In general, the constants of compensator block are chosen to provide suitable phase lead compensation in 0 to 3.5 Hz. Also, T1 > T2 and T3 > T4. The transfer function of the dynamic compensator is given as follows

$$T(s) = \frac{(1+sT_1)(1+sT_3)}{(1+sT_2)(1+sT_4)} \tag{1}$$

The complete transfer function of PSS is given as

$$PSS(s) = K_{PSS} \frac{sT_W(1+sT_1)(1+sT_3)}{(1+sT_W)(1+sT_2)(1+sT_4)} \tag{2}$$

Where K_{PSS}, T_W, T1, T2, T3 and T4 are gain, time constants of washout and compensator blocks respectively.

Design of Power System Stabilizer:

The objective of PSS is to mitigate the LFOs and thereby enhance the stability of the power system. The improvement in the damping and stability can be achieved by properly selecting the parameters of PSS. Here, the gain and time constants of PSS are selected using flower pollination algorithm with the aim of improving the system damping. In the following subsections, the FPA optimization technique and the formulation of objective function are explained.

Flower Pollination Algorithm based Optimization Technique:

FPA is an evolutionary optimization technique where the algorithm is based on nature inspired population. Surviving of best fittest plants is the main objective of the FPA to give the optimal reproduction of plants. Flower pollination is the process where pollens are transferred from one flower to the other giving rise to reproduction of the flowering plants. Switching action between local and global pollination is done by probability switch P. The range of probability switch (P) is lies in between 0 to 1 [12]-[14]. The four rules in FPA are as follows:

Rule 1: Biotic or cross-pollination is categorized as global pollination. The pollinators carrying pollen follow Levy flights.

Rule 2: Abiotic form of self-pollination is categorized as local pollination.

Rule 3: Insects act as pollinators introduce loyalty to flowers resulting into the growth of probability to generate new individuals; the probability is proportional to the similarity between two flowers taking part into the process of pollination.

Rule 4: Probability switch p [0, 1] is the controlling factor between global pollination and local pollination, somewhat biased towards local pollination.
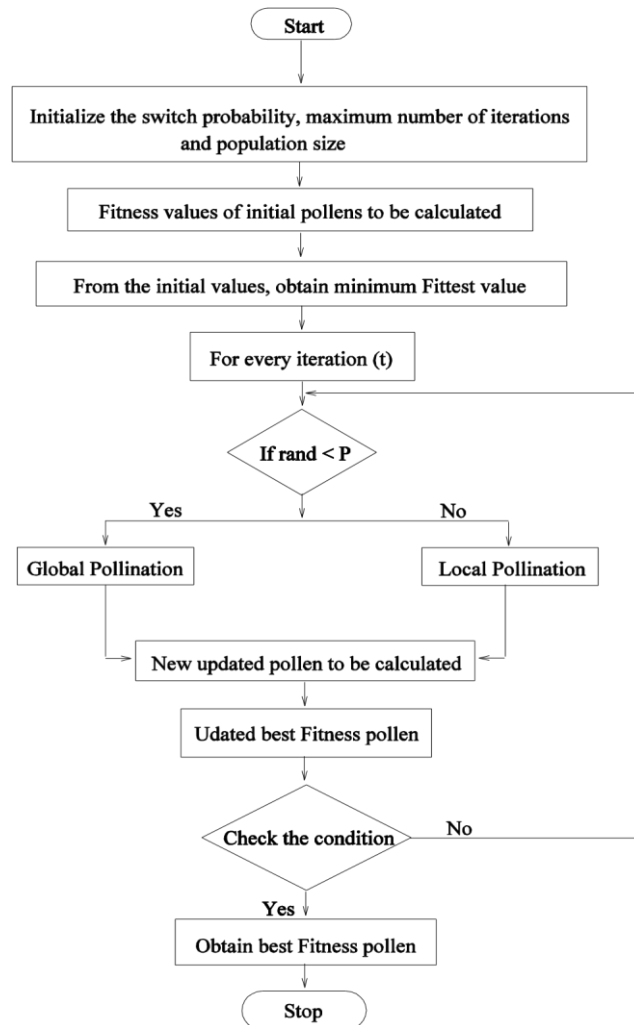
Fig. 3: FPA Flowchart

The following steps are involved in FPA:

Step-1: Setting the FPA parameters such as the number of generation (N), population size (n) and switch probability (p).

Step-2: Random initialization of the parameters Xi, under consideration takes place for the assumed population size N. The fitness value is evaluated by calculating the objective function with every solution (Xi).

Step-3: The process of global pollination starts with random number r for each solution (Xi), where r in [0, 1].

Step-4: If r < p, the Le'vy distribution is adopted to generate the new solution as

$$X_i^{t+1} = X_i^{t+1} + L(X_i^t - g^*) \qquad (3)$$

Were L is a Le'vy flight and L > 0. The Le'vy flight is determined using

$$L \approx \frac{\lambda \Gamma(\lambda) \sin\left(\pi \lambda / 2\right)}{\Pi} \frac{1}{S^{1+\lambda}}, \qquad (S \gg S_0 > 0) \qquad (4)$$

Step-5: Else, the local pollination takes place by producing random number⬚, where ⬚ in [0, 1]. Step-6: Each solution (Xt+1) is calculated and the population is updated according to fitness value. Step-7: Sorting of solution and the newest best solution g* is found. Step-8: Step-3 to step-7 are repeated till the termination condition is satisfied. At the end, the best solution is presented.

The non-linear optimization problems can be solved by employing FPA. FPA yields better performance compared to other optimization techniques. FPA gives numerous following advantages over conventional optimization techniques; such as, quick convergence, minimum complexity, superior computational speed and better performance. The flowchart of FPA is considered for the controller parameter optimization is shown in Figure 3.

Formulation of Objective Function:

The optimal set of PSS parameters is obtained using FPA. The primary objective in the design of PSS is to improve the system damping which can reduce the overshoot in rotor oscillations and suppress the oscillations in less settling time. Also, the stability of the system to be maintained.

Considering these facts, the objective function E is formulated as:

$$\text{SumSquaredError}(E) = \sum_n e^2 \qquad (5)$$

Where e = Tm-Te

n = 1, 2,.........m.

m is size of Tm array with transient simulation carried out for 2 sec.

Tm is the mechanical torque and Te is the electrical torque.

The objective function E is the sum of square of the difference between the mechanical and electrical torque, while maintaining the stability of the system.

Hence, to achieve the desired performances, the optimization statement is structured as Minimize E Subjected to the condition that Real part of all eigenvalues < 0.

The boundary limits of PSS parameters are given as

$$K_{PSS_{min}} \le K_{PSS} \le K_{PSS_{max}} \qquad T_{W_{min}} \le T_W \le T_{W_{max}}$$
$$T_{1_{min}} \le T_1 \le T_{1_{max}} \qquad T_{2_{min}} \le T_2 \le T_{2_{max}}$$
$$T_{3_{min}} \le T_3 \le T_{3_{max}} \qquad T_{4_{min}} \le T_4 \le T_{4_{max}}$$

The range of PSS parameters is assessed from the locus of eigenvalues. The trajectories of eigenvalues for the variation in controller parameters are shown in Figure 4. We observe that for the large values of time constants (T1 and T3), locus of eigenvalues are moving to right side of complex plane, hence the damping reduces and the eigenvalues are unstable. Hence, from the trajectories of eigenvalues and the realistic values of PSS parameters, we choose the upper and lower boundaries for controller parameters. Using FPA, the optimal parameters are obtained as: KPSS = 5.5, TW = 11, T1 = 0.15, T2 = 0.04, T3 = 0.15, T4 = 0.04

III. Results and Discussion:

The performance of the system with FPA optimized parameters for PSS is determined by transient simulation and eigenvalue analysis. In transient simulation, the step change in the reference value of mechanical torque is applied at 0.5 sec and removed at 1.0 sec. In the FPA optimization process of PSS parameters, the best minimum value of objective function for different iteration and population sizes are plotted in Figure 5 and Figure 6. From Figure 5 and Figure 6 we observe that the value of objective function converges to best minimum in less number of iterations with increase in population size.
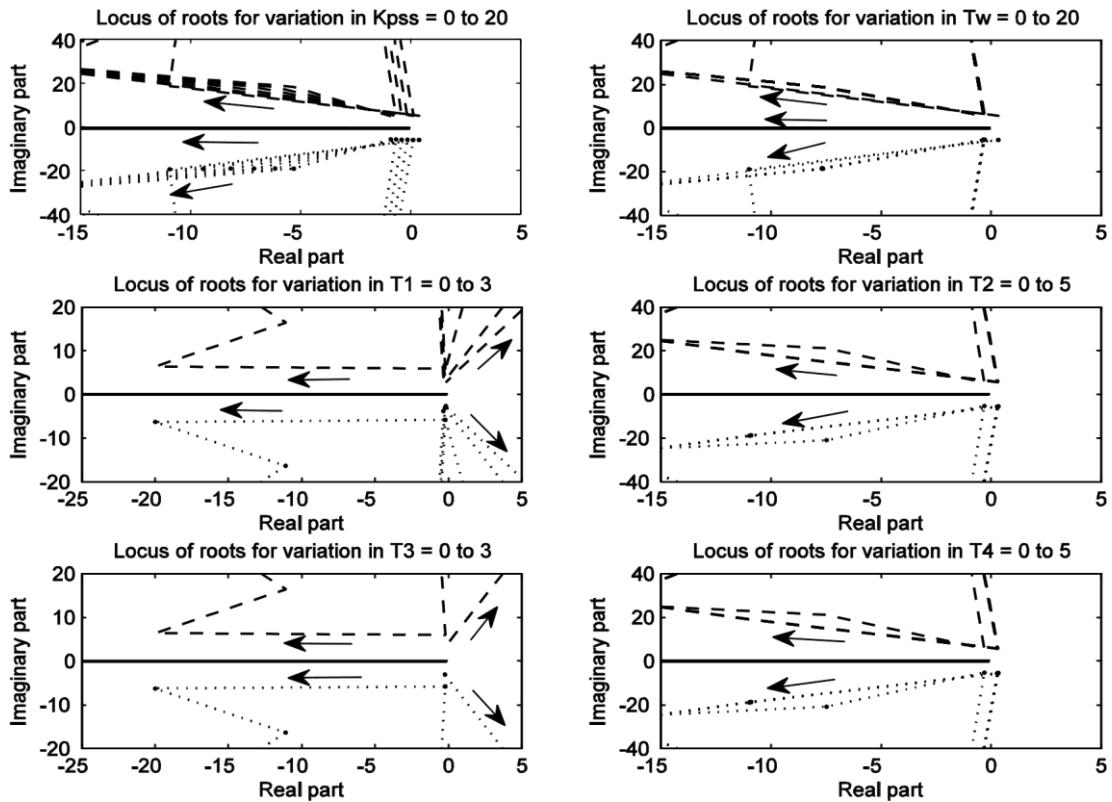
Fig. 4: Movement of the eigenvalues with the variation of PSS parameters

The location of eigenvalues in complex plane is plotted with optimal PSS parameters in Figure 7. In Figure 7, all the eigenvalues are on left half of the complex plane with optimal PSS parameters indicating that the system is stable. The response of rotor angle with optimal PSS parameters for the step change in mechanical torque is plotted Figure 8.
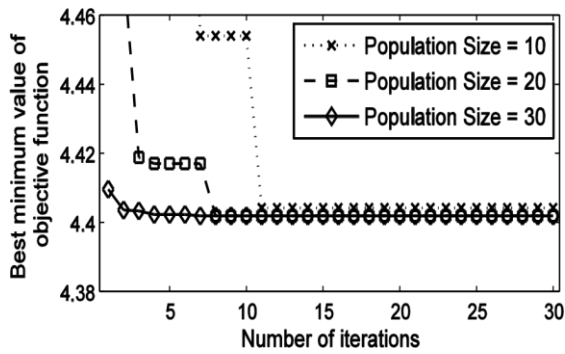
Fig. 5: Best minimum value of objective function in every iteration for different population size with 30 iterations
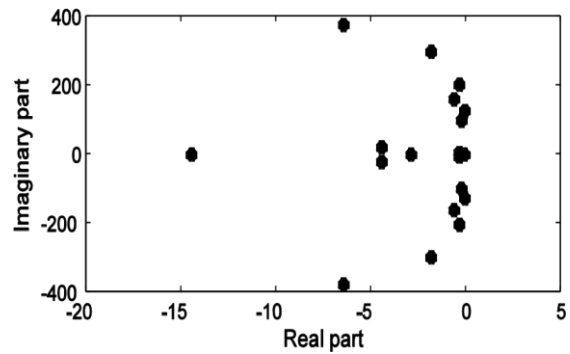
Fig. 7: Location of eigenvalues in complex plane with optimal PSS parameters(Real part)
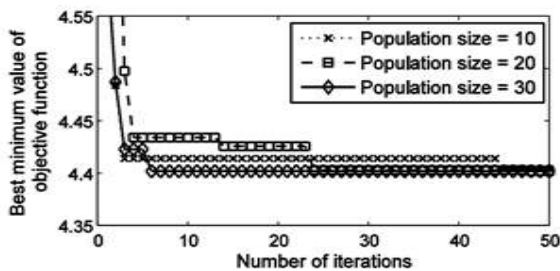
Fig. 6: Best minimum value of objective function in every iteration for different population size with 50 iterations
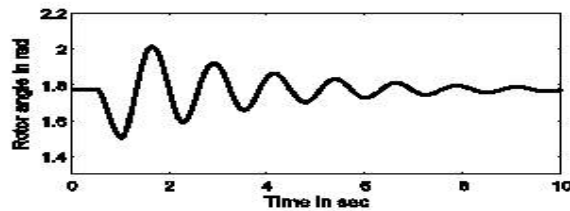
In Figure 8, the oscillations in generator rotor reduce with time and reaches steady state value. Hence, it is evident that the application of FPA to optimize the PSS parameters ensures the stability of the system.

IV. Conclusion:

In this paper, we have presented a systematic concept for the selection of PSS parameters based on FPA and to mitigate the LFOs of generator rotor. The FPA based optimization technique is used to optimize the controller parameters which ensures that the system is stable at the operating system conditions. The stability of the system is evident from the location of eigenvalues. The transient simulation results show that the rotor oscillations can be suppressed and reaches to steady state. The advantage of FPA is the fast convergence with less complexity.

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Lab View FPGA Implementation of Pi Controller Based BLDC Motor Drives

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ABSTRACT

This Paper presents a novel hardware design methodology of BLDC motor speed control system. Simulation studies are conducted with the effect of a sudden change in reference speed and load are also included. Finally, the proposed PI (Proportional-Integral) based BLDC motor drive system with a rating of 3 phase, 30V, 400W, 3000 RPM is implemented using Spartan 3 Field Programmable Gate Array (FPGA) from Xilinx. Flexible FPGA module allows easily reuse of code used in development process during actual hardware implementation. Programmed FPGA with Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is developed. The superiority of the proposed scheme on the aspects of the speed parameters is demonstrated using Lab VIEW monitoring.

Keywords : PWM, PIcontroller, FPGA, Speed Control, Spartan-3E

I. INTRODUCTION

Many of the industrialized drives depend on electric motors for their production, therefore an efficient speed control of the motor is necessary. The essentiality of the BLDC motor and its application is felt strongly worldwide [1]. The development of PI control theories has already 60 years so far, however, this method is still extensively used now. PI-controller and its modifications are the most common controllers in the industry. It is robust and simple to design, its operation is well known, it has a good noise tolerance, it is inexpensive and it is commercially available. In a conventional PI controller, tuning of control gains namely proportional gain (k_p) and integral gain (k_i) of a speed control system is the adjustment of its control parameters like overshoot and settling time. It is always desirable to get the optimum process response. So, PI controller is used with manual tuning methods like Ziegler-Nichols method for proper tuning of control gains k_p and k_i and to adjust the system to desired response and to maintain the control loop closed [1]. The modelling of conventional PI controller is done by using Matlab/Simulink, and the performance analysis is made at the different reference speeds and at various loads. The dynamic conditions of the motor drive system have also been simulated. Lab VIEW FPGA module is used to design the whole system that

include analog capture circuit to take out the analog signals (set point and process variable) from the real world, PI controller module, and PWM signal generator module to drive the motor[2]-[4].The physical implementation of the digital system is based on Spartan-3E FPGA from Xilinx. This work is to focus on PI controller design to improve the speed performance of BLDC motor drive system at various

set speeds and at different load conditions. Using Matlab/Simulink model, speed parameters of drive system is also analysed. It is realized with the help of Very high speed integrated circuit Hardware Descriptive Language (VHDL) programming algorithm of digital Pulse Width Modulation (PWM) generator topology [5, 6].

II. CONVENTIONAL PI CONTROLLER
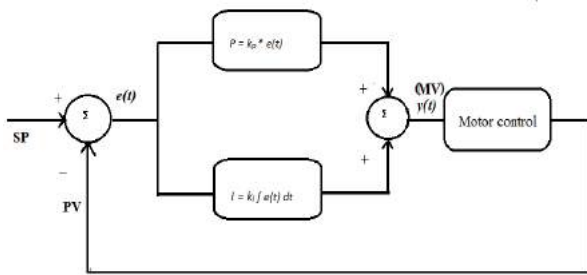
Fig1: Basic block of PI controller

The basic block of PI controller is shown in Fig1. The PI controller calculates an error value as the difference between a measured Process Variable (PV) and the desired Set Point (SP). The instantaneous value of controller output is given by

$$y(t) = MV = k_p e(t) + k_i \int e(t) \qquad (1)$$

$$e(t) = SP - PV \qquad (2)$$

where k_p is the proportional gain

k_i is the integral gain

e(t) is the instantaneous value of error

The PI controller can be modelled easily in Matlab/Simulink software using available tools like gain, summing block, subtraction block and integral block. Tuning the controller is necessary to get the optimum process response. There are several methods available for tuning the controller parameters. Here to adjust the system to the desired response, the parameters of controllers must be changed by the manual tuning methods like Ziegler-Nichols method for maintaining the closed loop system. Tuning the control gains k_p and k_i of a control system is the adjustment of its control parameters like overshoot, settling time to the optimum values for the desired control response.

III. SIMULATION

In BLDC motor drive, PI controller is used in speed control loop. Speed error is given as input to the PI controller. It determines the reference value of voltage V_{ref} to control the drive parameters. The controller gain in the PI controller is set as k_P=1and k_i=5 using Ziegler-Nichols method of PI tuning. Dynamic response of the drive is analysed, and it depends upon the reference voltage produced by the speed loop in PI controller of the drive system. The voltage reference from speed loop decides the PWM signal of a three phase inverter. Since the motor fed by the inverter, output voltage of the inverter decides the speed of the motor. The performance of the drive is analysed with various set speeds and various load conditions .Simulation model of BLDC motor drive using PI controller is shown in Fig 2.
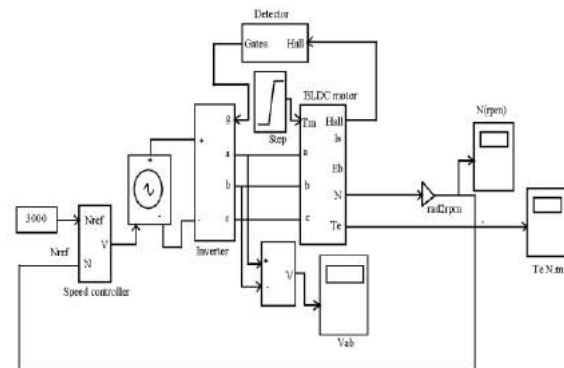
Fig2: Simulation model of BLDC motor drive drive using PI controller
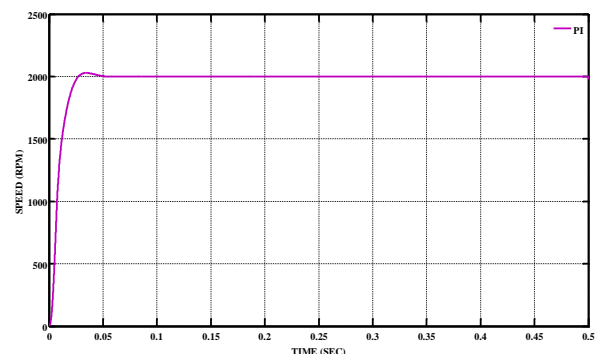
FigError! No text of specified style in document.: **Speed responseof BLDC motor drive drive at no load using PI controller**

Speed response of BLDC motor drive at a reference speed of 2000 RPM is shown in Fig. During this analysis, the motor run at no load. Peak overshoot is high with a change in speed. At starting the motor gets oscillated due to change in speed of 2000 RPM. Then,it runs at set speed till the load is varied. The PI controller based drive gets oscillation when starting torque is high. It is the effect of poor control due to overshoot in the reference voltage produced by PI controller. This overshoots reflects on motor speed and settles to zero after some delay because the motor starts with no load.
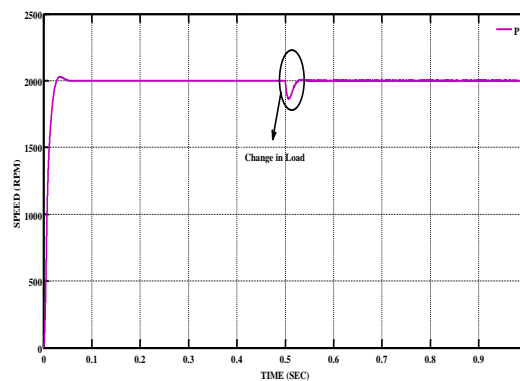
Fig 4: Speed response of BLDC motor drive at load of 1.2 Nm using PI controller

Speed response of BLDC motor drive drive at load of 1.2 Nm using PI controller is shown in Fig 4. The time taken to settle back to its reference speed after speed drop is stated as restoration time. It is evident that the restoration time has reduced. The speed drop is also high when there is a change in load. For variable load analysis, the load is increased from no load to 1.2 Nm at 0.5 sec and then torque

settles at steady state condition at 0.54 sec. After load change, the motor settles with a restoration time of 0.06 sec. It can also be observed from the simulation results that performance of PI controller is poor during the case of speed variation.

Speed (RPM)	Peak Overshoot (%)	Steady state error (%)	Rise time (sec)	Peak time(sec)	Settling time(sec)	Speed drop during 0.6 0.6 Nm load change %	Restoration time (sec) 0.6 Nm load change	Speed drop during 1.2 Nm load change (%)	Restoration time (sec 1.2 Nm) load change (%)

Table 1. Performance of BLDC motor drive using PI controller

1000	0.04	0.027	0.0177	0.0414	0.05	10.5	0.026	11.9	0.03
1500	0.53	0.018	0.0201	0.036	0.08	7.5	0.053	8.5	0.06
1800	1.03	0.017	0.0209	0.035	0.08	6.5	0.044	7.4	0.05
2000	1.4	0.015	0.0213	0.035	0.1	6.07	0.053	6.9	0.06
3000	3.33	0.01	0.226	0.035	0.115	4.7	0.07	5.3	0.08

Speed response of BLDC motor drive using PI controller at various speed is shown in Fig5. When the reference speed varies from 2000 RPM to 1500 RPM at t = 0.3 sec, speed error increases, the PI controller produces increased voltage as a reference voltage to attain the set speed. At the time of 0.5 Sec, the load is increased first to 50% and then to 100%, and the performance parameters are shown in Table 1. The speed drops when the load is increased. It causes an increase in error sensed by PI controller and it increases DC voltage to the inverter increase the speed and attains the set speed after restoration time. The motor settles at set speed with less overshoot. Speed drop during a load change produces oscillation in the speed performance of BLDC motor. When 0.6 Nm load and 1.2 Nm load is applied, torque of the machine gets increased with less overshoot. This oscillation exists up to 0.54 secat a speed of 2000 RPM.

The perfect rise in voltage increases the speed and attains the set speed after the restoration time. Speed drop during load change in percentage value lies in the range of 11.9 to 5.3. Restoration time lies in the range of 0.03 sec to 0.08 sec.

IV. EXPERIMENTAL SETUP OF PMBLDC DRIVE

An experimental setup has been designed and the hardware has been realized using a Spartan3 FPGA for a BLDC motorof rating 400W, 3 phase, 30V, 3000 RPM. The block diagram of the hardware is shown in Fig6. It comprises of a Spartan 3 FPGA, which can build PWM generator and an Analog to Digital Converter (ADC) unit. The MOSFET IRF840 is used as the switching device. The keypad is interfaced with FPGA to choose algorithm and control of the motor. Control of motor includes setting speed required, ON and OFF of the motor.

Fig 5:

Speed response of BLDC motor drive using PI controller at various speed

Drop in speed again increases speed error, and it is compensated by PI controller by raising reference voltage. It shows that the motor follows the reference speed and produces minimum speed error.
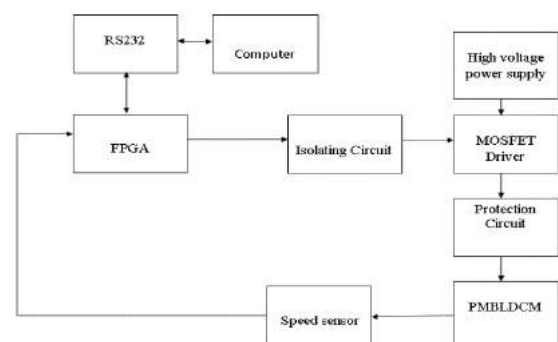
Fig 6: Block Diagram of BLDC motor drive [9]

4.1 Spartan 3 FPGA

The Spartan-3 family builds on the success of the earlier Spartan-3 family by increasing the amount of

logic per I/O, significantly reducing the cost per logic cell. The Spartan-3 family features a rich network of traces that interconnect all five functional elements, transmitting signals among them. Each functional element has an associated switch matrix that permits multiple connections to the routing [9].

4.2 Lab VIEW

Lab VIEW is a type of graphical approach of programming that helps to visualize each and every aspect of the given application from National Instruments. Since this might be the case for multiple nodes simultaneously, lab VIEW as denoted by G is inherently capable of parallel execution [10]. This implies that each VI can be simply tested before being embedded into a larger program as a subroutine [11,12].A benefit of using Lab VIEW environment is the independent nature of the G-code, which is (with the exception of a few platform-specific functions) portable between the different Lab VIEW systems for different operating systems (Windows, Mac OS X, and Linux) [8,9]. National Instruments is increasingly focusing on the capability of providing Lab VIEW code onto an increasing number of targets including devices like Phar Lap OS based Lab VIEW real-time controllers, Pocket PCs, PDAs, Field Point modules and into FPGAs on special boards [14-17].

V. HARDWARE IMPLEMENTATION

. Experimental Setup of BLDC motor drive is shown in Fig7.

Set Speed	Peak overshoot%		Steady state error%		Speed drop during load%		Settling time after load Change Sec	
	SIM	EXP	SIM	EXP	SIM	EXP	SIM	EXP
1500	0.53	0.5	0.0018	0.2	8.5	9	0.06	0.19
2000	1.4	1.3	0.015	0.15	9	11	0.07	0.15
2500	2.2	2.8	0.0002	0.12	6	9.5	0.08	0.14
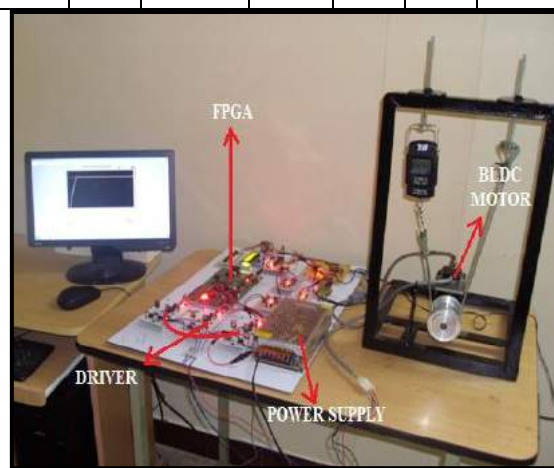
Fig 7: Experimental Setup of BLDC motor drive
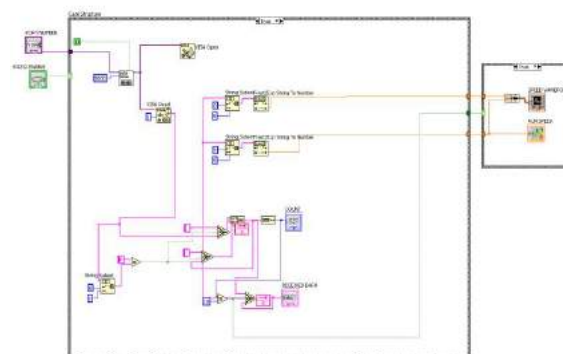
Fig 8: Block Diagram of BLDC motor drives when RS232 is disabled

The Lab VIEW program has two screens front screen and block diagram. The front screen consists of inputs and outputs. Block diagram consists of the control circuit. The block diagram of Lab VIEW program using VISA tool is shown in Fig8. It states the condition when RS232 is enabled. The speed graphs in LABVIEW at speed reference as 1500 RPM

are shown in Fig10.Experimental results are given in Table 2.

Table 2. Experimental performance of PI controlled BLDC motor drive
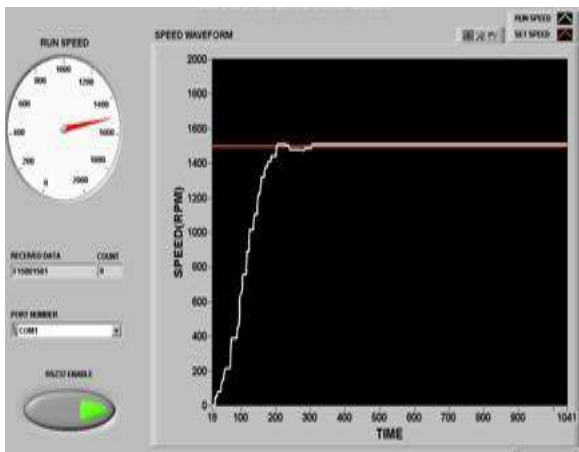
Fig 10: Speed performance using PI controller

II. CONCLUSION

In this paper, the speed control of BLDC motor drive with PI controller is studied. Using Matlab/Simulink, a simulation model has been developed. A BLDC motor of rating 3 phase, 30V, 400W, 3000 RPM is experimented using the Spartan 3 FPGA kit. Experimental setup of PI based BLDC motor drive using Spartan 3 FPGA is discussed. Experimental analysis is done with various loads of 1.2 Nm load, 0.6 Nm load, and no load. Speed drop during maximum load of 1.2 Nm change is only 3% at 3000 RPM. To demonstrate the learning capability and the applicability of the proposed controller, various test cases are performed under different operating conditions. The results validate that the experimental results are very close to the simulation results.

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Augmented Reality Based SMART GLASSES

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ABSTRACT

Smart- Glasses are the wearable computing device which can be attached to the spectacles or sunglasses of the user and can be paired with Smart Phones, via Bluetooth or Wi-Fi. In this paper, the authors are using the concept of Augmented reality to put a projection of user's smartphones notifications such as Date, time, incoming calls, text messages to the user's spectacles which acts as a virtual transparent screen to show those notifications while at the same time viewer can be interactive to surroundings without hindering his/her usual tasks in real-time.

Keywords : Smart- Glasses, Augmented reality, the wearable computing device

I. INTRODUCTION

Today new technologies are emerging every day, one such technology is Augmented Reality, Smartphones & media devices are very popular & are a great way to receive audio, video and accessing the internet. After 2010, the Google Glass came in the market which was the wearable device in form of glasses helped to continue lots of research & applications [1]. One of the uses of this device is to avoid accidents. Most accidents happen in the city due to the distraction caused by phone calls while riding. This could be developed as a device that helps in delivering message notifications and navigates users through the helmet, causing lesser distractions thereby making it a safe ride. To make up the projection onto the glass screen the authors are utilizing the following concept

- The basic laws of physics namely Reflection & Magnification.
- Microcontroller Arduino NANO ATmega328p & its programming.
- Bluetooth module HC-05 for the integration of IoT.
- 3-D designing using Solid Edge.
- Laser-guided cutting for making the case.

This paperwork is inspired by the idea of a Smart multimeter display created by Alain's project [23]. Even further our vision to extend this work is to integrate an image recognition camera & integrate machine learning & Artificial intelligence to automate the process of attendance system in the classroom. In the proposed design, the device is made as a mounting on frame which can be joined with any glass spectacles [2]. It runs on Arduino Nano Micro-controller having ATmega328p Microcontroller (MC), which is programmed to connect with Smart-Phones through an android application. A Bluetooth module, named HC-05 is interfaced with Arduino Nano to connect with smart-phones. A DC battery of 9V is used as the power supply for Smart- Glass. SSD1306, 0.96" OLED display is interfaced with Arduino Nano, which displays the data received from Smart-phones, Smart-

Phone application is used to transmit data of the phone, i.e.; Date, Time, Notifications of Phone call and Text messages [3].

Reflection & Magnification phenomena

Reflection of Light is the process of bouncing back the ray of light which falls on the surface of an object [5].

There are three laws that govern Reflection and Refraction.

1. The angle of Incident Ray with Normal(i) EQUALS Reflected Ray with Normal(r). (i=r)
2. Popularly known as **SNELL'S LAW** it is n1*sin i=n2*sin e   where 'i' is the same as above is the angle of refracted beam with normal.
3. The incident ray, reflected ray, refracted ray and the Normal at the point of incidence all lie in the same plane. The plane is referred to as *plane of incidence.*
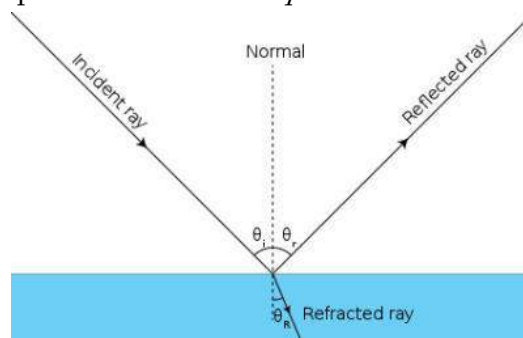
Fig. 1. Reflection of Light [6].

Properties of Reflection by plane mirror [7]. –

1. The size of the image is equal to that of the object.
2. The image formed is as far behind the mirror as the object is in front of it.
3. The image is laterally inverted.
4. The image formed by a plane mirror is always virtual and erect.

Magnification by the Lens (magnifying glass)

A magnifying glass is a **convex lens** that is used to get a **magnified image** of an object. The **lens** is fixed in a frame with a handle. It consists of many very narrow concentric ring-shaped lenses, such that the combination acts as a single lens but is much thinner. This is known as the Fresnel lens [8].
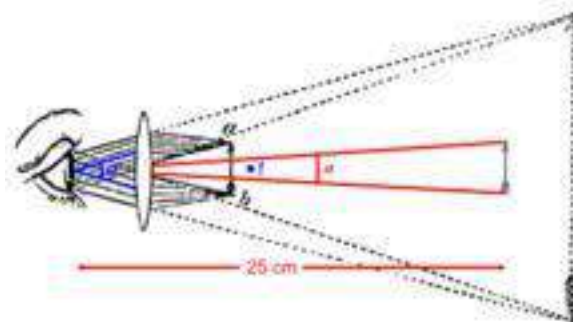
Fig. 2. Concave lens (Magnification process)

magnification is calculated using the lens' maker's equations [10]

$$1/f = 1/v - 1/u \hspace{8cm} (1)$$

Where *f* is the focal length of the lens, *u* is the distance of the object from the lens and *v* is the distance the image is formed from the lens.

$$M = vu \hspace{9cm} (2)$$

The size of an object's image is larger (or smaller) than the object itself by its magnification, M. The level of magnification is proportional to the ratio of v and u. An image that is double the size of the object would have magnification M=2.

Application

The following are the applications of our developed project & its technology in the real world.

Medical Field - In MRI scanning & to do complex surgeries, AR technology can go to the in-depth and efficiency of tasks such as examining the human body in an interactive 3D format.

Modern Market - In today's shopping trend, shoppers are using their smartphones to compare prices & look information on products they are using, by developing an AR app that shoppers can use to have a demo simulation.

Manufacturing & Maintenance - One of the biggest industrial use cases of AR is for repair and maintenance of complex equipment. Whether it's a car motor or an aircraft machine, repair and maintenance staff are beginning to use AR headsets and glasses while they perform their jobs to provide them with useful information on the spot, suggest potential fixes, and point out potential trouble areas. This use case will only continue to get stronger as machine-to-machine IoT technology grows and can feed information directly to AR headsets.

Designing - In interior design & architecture and construction, AR is helping to simulate their final products & structures. The use of headsets enables architects, engineers, and designers to view directly their buildings and models to see how their designs might look, and even make virtual plans on the spot. City planners can even model how entire city layouts might look using AR headset visualization. Any design or modeling work involving designs is a perfect tool for AR.

Education Field - The smart classes are becoming smarter by advent of 3D viewing technologies, making the projections of course materials & chapter contents, learning is more

enhanced & students become more interactive to view everything in 3D.

Entertainment & gaming industry - The biggest use is in the gaming industry, with the games like Pokémon – go, AR technology makes the game more interactive & livelier as every event seems to happen in the real world. Users feel better immersed in the game making the whole new experience. In entertainment sector, making devices using IoT that can stream audio, video news feed in front of viewer's eyeglasses opens a whole new range of market for these devices.

Public Safety & defense - At times of emergency today, people will immediately reach for their smartphone to find out what's going on, where to go for escape, and people are safe or not. First responders can arrive on the scene of a fire or earthquake trying to figure out who needs help, and the best way to get them to safety. AR is solving both issues of public safety, responders wearing AR glasses can be alerted to danger areas and show in real-time individuals that need assistance while enabling to still be aware of their surroundings. For those in need, geolocation enabled AR can show them directions, and the best route to, safe zones and areas with firefighters or medics. Military or intelligence spy's wearing AR glasses can monitor any suspect or terrorists.

Working of the proposed design

The following are the main steps that are implemented during the whole process [3].

- Notifications Received.
- Encoding.
- Transmitting and Receiving.
- Decode and Process.
- Execution.

The app on the phone creates a virtual server between the Bluetooth module & Arduino Nano. Data in the graphic form such as time & incoming call notification is transmitted to 3 Arduino's digital pin. The digital pin being connected to OLED forms the visual. Visual formed is reflected by a mirror at 45 degrees' inclination in the case. Reflection received is magnified by a concave lens & then projected to acrylic screen forming a prism-like 3D projection of visual to the human eye.
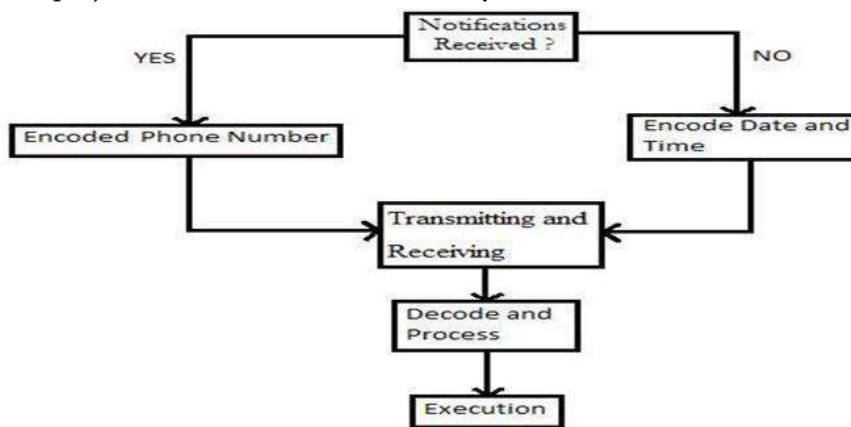
Fig. 3. Programming logic of proposed design [19]
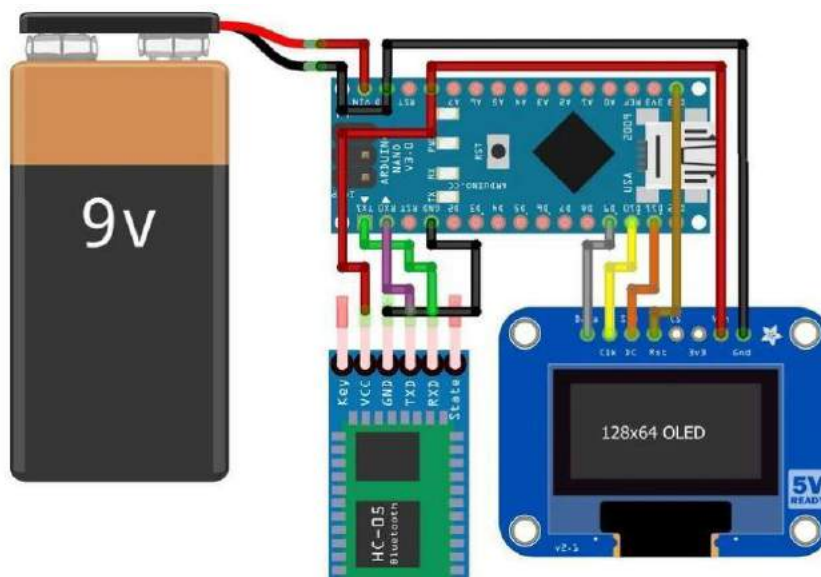
Fig. 4. Circuit Diagram 1 of the proposed design [19]
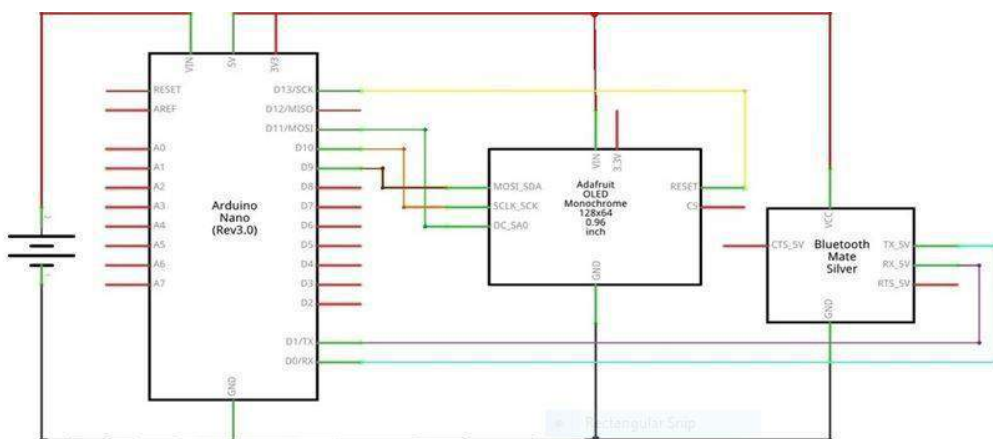
Fig. 5. Circuit Diagram 2 of the proposed design [19]
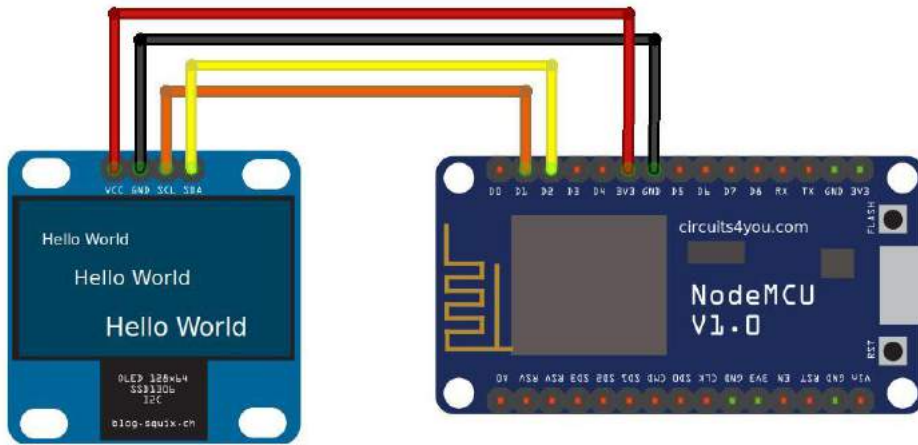
Fig. 6. Alternative Circuit drawn using Circuit.io [21]
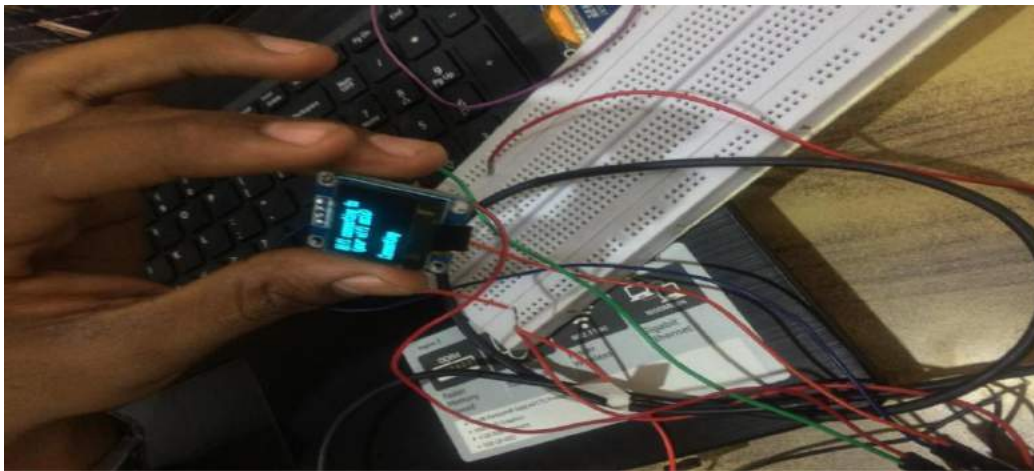
Fig.7. Hardware Picture 1 of the proposed method
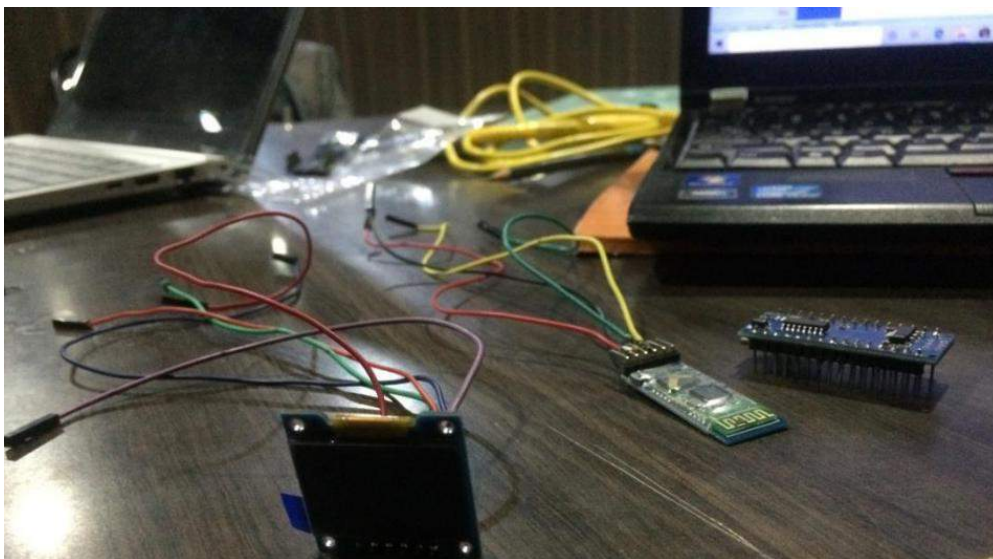
Fig.8. Hardware Picture 2 of the proposed method

Conclusion

The AR-based smart glass is successfully made having following features & advantages. It is Cheaper compared to HUD glasses in market and can also be made using household materials and makeshift things. It also Light-weight & can be carried easily anywhere, In other sense, it is Portable economically. The author developed IoT based products in such a way that it is Easily wearable & of stylish in looks. It Can also be used in various inter-disciplinary fields such as defense & security, education & Gaming.

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Equilibrium analysis and LSER modelling for extraction of Trans-aconitic acid using Tri-butyl Phosphate by using Xylene and Benzene

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ABSTRACT

Reactive extraction of Trans-aconitic acid from its aqueous solution has been carried out by Tri-butylphosphate as extractant and benzene, xylene as diluents. The study has been performed at room temperature and distribution coefficient (KD), extraction efficiency (E %) and equilibrium complexation constant (K11) has been found out. The maximum value of KD = 9.098454, E%=90.09749 was found out for 0.689219 mol/L trans-aconitic acid, 1.40733mol/L (40%) Tri- butylphosphate and benzene. The paper has presented linear solvation energy Relationship (LSER) model for trans-aconitic acid using tri-butyl phosphate in benzene, xylene.The LSER model with regression coefficient of 0.9845 is obtained. The model value is close to the experimental data.

Keywords: Trans-aconitic acid, Tri-butylphosphate, LSER, benzene, xylene

I. INTRODUCTION

Aconitic acid is naturally occurring acid present in plants like sugar cane, beet root. It can also be prepared from sugar cane juice and molasses. It is also an intermediate acid in TCA cycle. It can be produced by fermentation of aspergillus niger. (GB Patent No. 0146378A2, 1985)It is unsaturated tri-carboxylic acid and polybasic acid. It can be used as plasticizer for synthetic rubber, wetting agent and resin manufacturing units. It can be found in two isomers, Cis and Trans. The Cis-aconitic acid can be prepared by hydrolysis of the cis-anhydride under careful controlled condition rather Trans-aconitic acid is prepared by the sulfuric acid dehydration of citric acid. Trans- aconitic acid is more stable acid rather Cis-aconitic acid is a strong acid. It has been found during research that in equilibrated solution contains approximately 85% Trans- aconitic acid. By fermentation aconitic acid can be recovered as aconitate from Cuban and Louisiana blackstrap molasses require large amount of chemicals. Aconitic acid can be used as basic reactant for many components like Itaconic acid, Citraconic acid, Tricarballylic acid, many polymers such as copolymers of alkyl aconitates and vinyl chloride. It can also be used as plasticizers in the preparation of

stabilized vinylidene chloride composition (M.Cantor, 1951).

Reactive extraction of Trans-aconitic acid has been studied by tri-n-butylphosphate and found suitable (Vilas C.Renge, 2012).After this research there is no work found in the current topic. The behavior of aconitic acid is similar to Maleic acid and Fumeric acid (M.Cantor, 1951).Reactive extraction of Citric acid and maleic acid has been carried out by using phosphorous extractant and amine extractant with different solvents by (Erdem Hasret, 2017).In their investigation, TOPO and DOA has been used as extractant with nine different solvents for the extraction of Citric acid and maleic acid and found that phosphorous or amine extractant enhance the recovery of carboxylic acid from their aqueous solution. Fumeric acid has been produced by fermentation of Rhizopus oryzae and extracted by organic liquid membrane. (Yadvaindra Sood, 2014).Extraction of citric acid, pyruvic acid, Caproic acid, Acrylic acid, Vulneric acid, mallic acid has been studied by researchers using Tri-n-butyl phosphate as an extractant (Amit Keshav, 2009).The present work is focused on reactive extraction of Trans-aconitic acid from its aqueous solution by using tri-butyl phosphate as extractant and benzene and xylene as a diluent. The basic factors required for extraction has been studied and linear solvation energy relationship (LSER) model has been applied for the interpretation of data.

II. MATERIALS

Aconitic acid, ($C_6H_6O_6$), Molecular weight 174 g/mol is an unsaturated tribasic aliphatic acid existing in two geometric forms, the trans- isomer, TAA, and the cis- isomer . Trans Aconitic acid, also known as TAA, is a white to yellowish crystalline solid, with melting point 195 °C. Its IUPAC name is trans-propene-1, 2, 3,-tri carboxylic acid and the molecular formula is $C_6H_6O_6$. Its Hydrogen bond donor count is 3 whereas its Hydrogen bond acceptor count is 6. It is soluble in water and alcohol. Its

solubility in water increases from 18.6 g/100 mL at 13

°C to 110.7 g/100 mL at 90°C (Patarau, 1989). TAA used here was 98% + pure, supplied by Sigma Aldrich.

Tri-n-butyl phosphate, also called as TBP, is a phosphorus bonded oxygen donor. It is a light liquid with pale yellowish colour. It has molar mass of 266.32 g · mol-1 and density of 0.976 g·cm-3. The molecular formula of TBP is $C_{12}H_{27}O_4P$. It is an odourless liquid. The freezing point of TBP is -79°C. The Boiling point of TBP ranges from 180°C-183°C. The Hydrogen bond donor count for TBP is 0, whereas Hydrogen bond acceptor count for it is 4. It is slightly soluble in water with solubility 280 mg/L at 25°C (Saegar VW et al.) It is a viscous liquid with coefficient of viscosity 3.39 cP at 25°C (Riddick J.A. et al). The TBP used was of extraction grade
(Volume fraction of 99%) and it was supplied by Loba Chemie Pvt. Ltd. India.
The solvents used during extraction were benzene, xylene and one natural solvent as Rice bran oil. Benzene is an aromatic compound with molecular formula C_6H_6. Its molecular weight is 78.11g/mol. Its Hydrogen bond dono & acceptor count is 0. It is a colourless liquid with characteristic aromatic odour. Its boiling point is 80.08 °C. Its viscosity & density is 0.562 cP and 0.8680 g/cm3 respectively at 30 °C. The benzene was also supplied by Loba Chemie Pvt. Ltd. India.

Xylene is also an aromatic compound. It exists in three isomers o-xylene, m-xylene &p-xylene. As they are structural isomers, the physical properties are almost similar. Xylene has a molecular formula C_8H_{10}; with molecular weight 106.168 g/mol. It is a colourless watery liquid with sweet smell. It is less dense than water. The Hydrogen bond donor & acceptor count for Xylene is 0. Its boiling point is 138.3°C. Xylene was also supplied by Loba Chemie Pvt. Ltd. India.

III. EXTRACTION EQUILIBRIUM

Physical Extraction:

The physical extraction has been carried with equal volumes of Trans-aconitic acid and Tri-butyl phosphate for 8 hrs. in a shaker without diluents. After 1 hr. of settling in separating funnel the aqueous phase has been titrated with freshly prepared 0.1 N NaOH .The concentration of organic phase has been calculated by mass balance. According to (C.J.King, 1986), physical extraction has been carried out in three steps (1) Ionization of acid in aqueous phase $KHAA$ (2)partition of un-dissociated acid in organic phase (P) (3)dimerization of acid in organic phase (D)

Ionization of acid in aqueous phase

$$HA_A \leftrightarrow H^+ + A_A^- \qquad (1)$$

(1) Partition of un-dissociated acid between aqueous (aq) phase and organic(org) phase

$$[HA_A]_{aq} \leftrightarrow [HA_A]_{org} \qquad (2)$$

(3) Dimerization of acid in organic phase

$$2[HA_A]_{org} \leftrightarrow [HA_A]_{2org} \qquad (3)$$
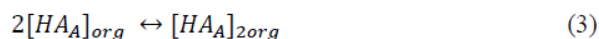
The overall distribution coefficient for physical extraction will be given by

$$K_D{}^{diluent} = \frac{P + 2P^2 D[HA_A]_{aq}}{1 + K_{HA_A}/[H^+]_{aq}} \qquad (4)$$

In a simpler form it can be written as

$$[HA_A]_{org} = P[HA_A]_{aq} + 2P^2 D[HA_A]_{aq}^2 \qquad (5)$$

The degree of extraction %E of Trans-aconitic acid is given by

$$E\% = K_D^{diluent} * 100/(1 + K_D^{diluent}) \qquad (6)$$

The values of partition coefficient and dimerization coefficient and degree of extraction has been mentioned in Table No. 3.1.The degree of extraction is obtained from equation (6) is very low for physical extraction. The regression equation for the physical extraction using benzene and xylene are obtained in the form

$$[HA_A]_{org} = P[HA_A]_{aq} + D[HA_{A\ aq}]^2 \qquad (7)$$

The partition coefficient and dimerization coefficient for xylene and benzene are represented in Table No.3.1 found out from equation no.7.The values of partition coefficient is less and dimerization coefficient is low .Though the value of Regression coefficient $R2$ is nearly equal one. Though the average values of distribution coefficient KD and extraction coefficient %E is higher for benzene rather than xylene. The Tri-butyl Phosphate has found to be effective extractant (Mangesh D.Waghmare, 2011)
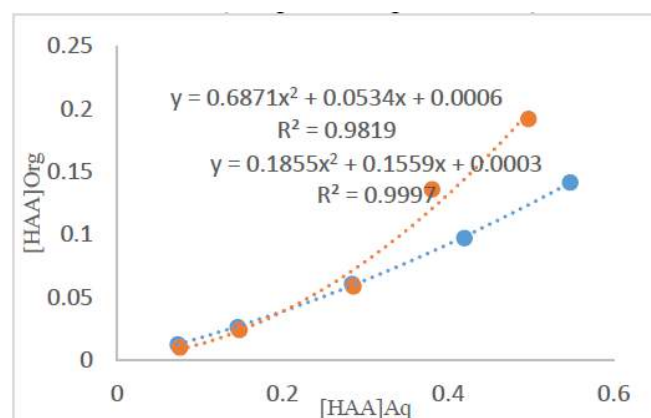
Fig. 1 Physical extraction of Trans-aconitic acid by

Benzene and Xylene

B. Chemical Extraction:

For chemical extraction, the initial concentration of Trans-aconitic acid concentration is in range of 0.086152 mol /m3 to 0.689219 mol /m3. Benzene and xylene are used as a solvent in combination with tri-butyl phosphate is 0.703665 mol /m3 and 1.40733 mol /m3 (20 % and 40%) as a diluent as it has low water co-extraction and low solubility in organic solvent. TBP has a phosphoryl group which is a stronger lewis base than the carbonyl group (Mangesh D.Waghmare, 2011). The basic aim of chemical extraction is to increase the extraction efficiency of solvent. When diluent is added with the solvent in appropriate proportion it increases its extraction efficiency thereby increasing the distribution coefficient .The diluent lowers the viscosity of the solvent and decreases surface tension

at the interface. (Mangesh D.Waghmare, 2011).The ratio of concentration of solvent to concentration of diluent is called as loading ratio, represented by Z.

Table 1. Partition coefficient & dimerization coefficient of Trans-Aconitic acid by using benzene & xylene

Solvent	Partition coefficient (P)	Dimerization coefficient (D)	Regression Coefficient R^2	Average K_D	Average %E
Xylene	0.6871	0.0534	0.9819	0.212119	17.44516
Benzene	0.1855	0.1559	0.9997	0.249614	19.44124

$$Z = \frac{[HA_A]_{org}}{S_{Org}^{Initial}} \qquad (8)$$

Where, $[HA_A]_{org}$ is the concentration of undissociated Trans-aconitic acid and $S_{Org}^{Initial}$ is initial concentration of tri-butyl phosphate in organic phase. S_{Org} can be expressed as

$$[S]_{org} = [S]_{Org}^{Initial} + p[HA]_{org} \qquad (9)$$

Where, p is solvation number

Since the Trans aconitic acid and tri butyl phosphate was used in all experimental runs were in (1:1) proportion, thus the plot of $\frac{Z}{1-Z}$ vs $[HAA]_{aq}$ gives the value pf equilibrium complexation constant K_{11}.

$$\frac{Z}{1-Z} = K_{11}[HAA]_{aq} \qquad (10)$$
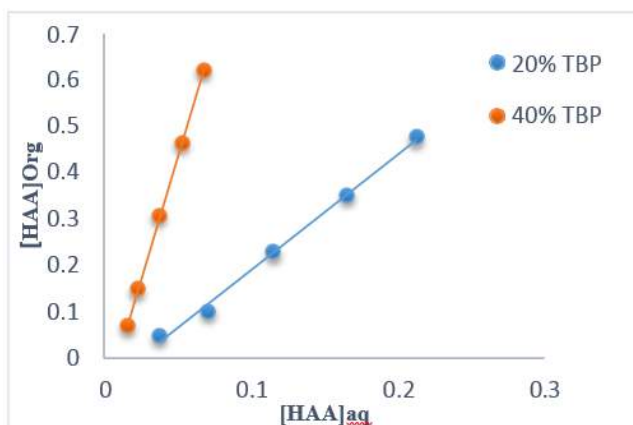
Fig. 2. Chemical extraction of Trans -aconitic acid by using 20% and 40% TBP with benzene as a diluents
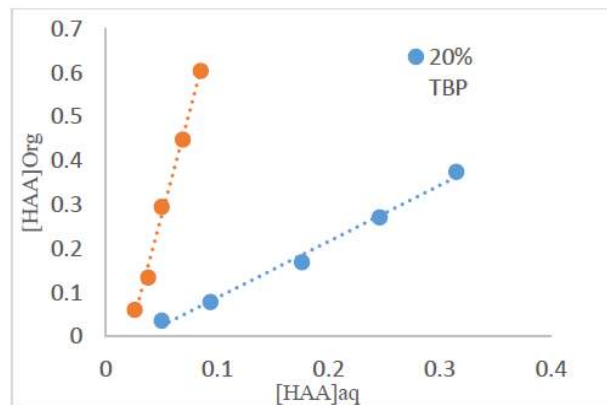
Fig. 3. Chemical extraction of Trans aconitic acid by using 20% and 40% TBP with Xylene as a diluents
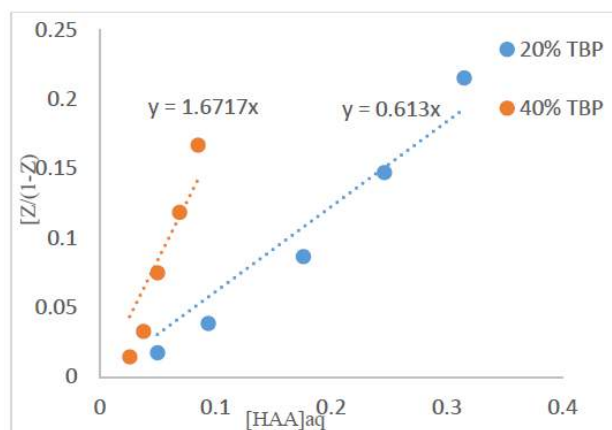
Fig. 3.2.3 Equilibrium complexation Constant of Trans-aconitic acid by using 20% and 40% TBP with Xylene as a diluents
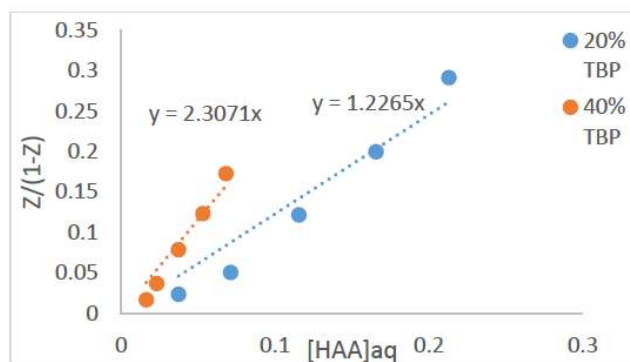
Fig.4. Equilibrium Complexation Constant of Trans Aconitic acid by using 20% and 40% TBP with Benzene as a diluents

IV. LINEAR SOLVATION ENERGY RELATIONSHIP (LSER)

According to (Mortimer J Kamlet.Jous-Luis, 1983); the linear solvation energy relationship (LSER) that measures property XYZ, in terms of solvent properties, is

$$xyz = xyz^0 + P\frac{\delta_h^2}{100} + s(\pi^* - d\delta) \qquad (11)$$

Where, δ is the Hildebrand's solubility parameter, $\pi*$, d, and δ are the solvatochromic parameters that measure the solute + solvent, dipole + dipole, and dipole + induced dipole interactions, respectively. The solvatochromic parameter α scale of solvent HBD (hydrogen-bond donor) acidities describes the ability of the solvent to donate a proton in a solvent-to-solute hydrogen bond. The β scale of HBA (hydrogen-bond acceptor) basicities provides a measure of the solvent's ability to accept a proton (donate an electron pair) in a solute-to-solvent hydrogen bond. The coefficients p, s, d, a, and b include the solute properties; p, s, d, and a are regression coefficients. The values of the solvatochromic parameters $\pi*$, δ , α and β have been found for several hundreds of compounds. Equation 11 can be adopted to describe the effect of diluents on the values of partitioning coefficients KD, in the form

$$lnK_D = lnK_D^0 + P\frac{\delta_h^2}{100} + s(\pi^* - d\delta) + a\alpha + b\beta \qquad (12)$$

Where the parameters (Mortimer J Kamlet. Jous-Luis, 1983)refer to the diluent, and K_D represents the partitioning coefficients for an ideal inert diluent. The second term of equation 4, which contains the solubility parameter, does not affect the values of the objective function significantly. Thus, equation 12 reduces to equation 13

$$lnK_D = lnK_D^0 + s(\pi^* - d\delta) + a\alpha + b\beta \qquad (13)$$

(Vladislav Bizak, 1993) calculated the solvatochromic parameters of the solvent mixtures according to equation 14

$$SP_{12} = X_1SP_1 + (1 - X_1)SP_2 \qquad (14)$$

Where X_1 is the mole fraction of the first solvent and $X_2 = (1 - X_1)$ is the mole fraction of the second solvent. SP_1 is the solvatochromic parameters of the first solvent and SP_2 is the solvatochromic parameters of the second solvent in solvent mixtures.

The resulting LSER regression equation by using curve fitting technique is

$$lnK_D = 6.221307864 + 0.437210413(\pi* -18.5115\delta) + 0\alpha + 2.61475369\beta \qquad (15)$$

The above equation 15 has been obtained by using equation (13) which is obtained by neglecting the solubility term (S.H.Hilal, 2004) and shown in Table 4.3. The solvatochromic parameters are available for wide variety of solvents (Mortimer J Kamlet.Jous-Luis, 1983). The values of solvatochromic parameters has been obtained from (Mortimer J Kamlet.Jous-Luis, 1983) and mentioned in Table 4.1.The experimental value of distribution coefficient K_D has been plotted against model value which are mentioned in Table 4.2 The graph between experimental value of distribution coefficient K_D has been plotted against model value shown in Figure 4.1which shows a regression coefficient (R^2) as 0.9845 which is near to 1.

Solvent	π^*	δ	B	A
Xylene	0.43	1	-	0.00
Benzene	0.59	1	0.10	0.00

Table 2. Solvatochromic Parameter Hydrogen-Bond Donor Acidities ($\pi^*$and δ) and Hydrogen-Bond Acceptor Basicity's (β and α) for Diluent Mixture:

LSER model parameter	lnK_D^0	Model Parameters				Coefficient of linear regression R^2
		s	d	a	B	
	6.221307864	0.437210413	-18.5115	0	2.61475369	0.9845

Table 3. Values of the LSER model parameters(s,d,b,a) & the Coefficient of Linear Regression($R2$)

Solvent	Concentration of TBP (V/V) %	Experimental Distribution Coefficient K_D	Model Predicted Distribution Coefficient K_D
Xylene	0	0.249613766	0.18561085
	20	0.960673214	1.1323879
	40	5.068013662	5.19955687
Benzene	0	0.212118859	0.25854799
	20	1.810751661	1.47620088
	40	7.325536837	6.34350101

Table 4.Comparison of experimentally determined & model predicted Distribution Coefficients
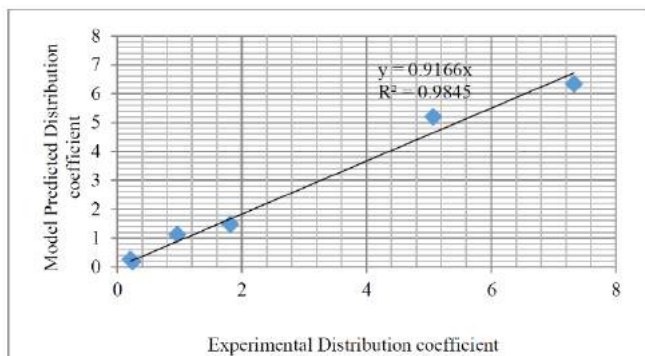
Fig. 5. Comparative graphical representation of experimental distribution coefficient Vs. model predicted distribution coefficient

V. CONCLUSION

The reactive extraction of Trans-aconitic acid is carried out from its aqueous solution by using TBP as extractant and benzene and xylene as a diluents. Physical extraction is seen to be less efficient as compared chemical extraction. The distribution coefficient, extraction efficiency and loading ratio and equilibrium complexation constant has been found out. The highest KD= %E = and K11= has been found out for Trans aconitic acid and xylene and TBP system. The LSER model with regression coefficient of 0.9845 is obtained. Thus, LSER model predicts the equilibrium behavior of Trans-aconitic acid using TBP in benzene and xylene. References:

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Information Security with Cryptography

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ABSTRACT

Cryptography and Information Security help to protect data and network. Information security is the concept of transferring information over the wireless network in secure way. Nowadays transferring information from one place to another place can be easier but providing security for our information is quite difficult. Information security helps to protect our information form unauthorized users and attackers. Cryptography is a tool which satisfies information security over the computer network. Cryptography achieves information security by using encryption and decryption methods. Encryption is a process of converting original data into unreadable format and decryption is a process of converting unreadable format into readable format. In this paper we discuss about how cryptography provides secure data transmission over the Internet.

Keywords : Cryptography, Attackers, Encryption, Decryption

I. INTRODUCTION

In 1994, the Internet Architecture Board (IAB) issued a report entitled "Security in the Internet Architecture" (RFC 1636). The report stated that the Internet needs more and better security, and it identified key areas for security mechanisms. Among these were the need to secure the network infrastructure from unauthorized monitoring and control of network traffic and the need to secure end- user-to-end-user traffic using authentication and encryption mechanisms. Cryptography is the concept of sending secret messages between users. Cryptography focuses on the following things which helps to provide secure transmission.

Security Attack: The action that affects security of an information

Security Mechanism: The process which helps to secure our information from unauthorized access over the Internet

Security Service: Service which helps to transfer information between sender and receiver

Cryptography focusing on the above thing in wireless network to achieve information security. Cryptography works as follows:
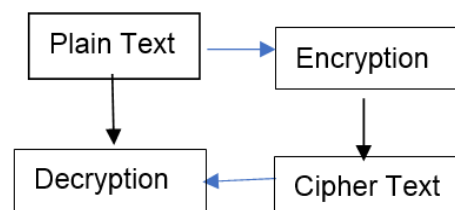
The above diagram illustrates about how cryptograph transfers information in secure way over the wireless network.

· The original information called plaintext that goes to the method called encryption
· Encryption is the process of converting original information into unreadable format. This is done by encryption algorithm there are many algorithms

used for this conversion we can choose any of the algorithm to convert original data into unreadable data. Eg: AES, DES, RSA

· The information which is in unreadable form known as cipher text

· Decryption is the process of converting unreadable format to readable format. The algorithm which has been chosen for encryption the same algorithm reverse logic will be used to get original data

The above four necessary steps are called cryptosystem. Cryptosystem needs plain text which has to be transferred to receiver, encryption algorithm which helps to convert original data into unreadable format, cipher text which does not read by others and decryption algorithm which helps to get back original data this will happen on receiver's system.

II. Security Attack

The action which has been taken against our information over the wireless network known as attack, the person who is doing this activity in computer network known as attacker or intruder. There are two types of security attacks

· Passive Attack

· Active Attack

A. Passive Attack

Passive attack technique attacks only on information. The message which is transferred between sender and receiver that gets affected by this technique. Passive attack can be done by two ways.

· Release of message contents: In this type of attack, the attacker will be focusing on sensitive information transferred from sender to receiver. The attacker will take over the message and the receiver will receive only empty messages from sender

· Traffic analysis: In this type of attack, the attacker keeps on focusing the route between sender and receiver and the attacker redirects the original route. So, the information will get delayed. Receiver may

not get original information on time, receiver may lose important information.

B. Active Attack

Active attack technique attacks and modifies original data. The message between sender and receiver will be stolen and that get modified by the attacker that modified data will be transmitted to receiver. So, the receiver receives modified data and he will do work on wrong information

· Masquerading: In this technique one person pretends to be a different person. Here attack sends information to the receiver as sent by the sender

· Replay: In this technique attack captures message form sender to receiver, later the attack replays the message to the receiver

· Modification of messages: In this technique the message which is transferred by the sender will be captured immediately by the attacker and the attacker will do some modification on the message, that modified message will transfer to the receiver

· Denial of Service: In this technique attacker will be attacking the server system, whenever sender tries to transmit information to the receiver, he will get network error or server error. So, he will not be able to transmit information to the receiver

III. Security Services

Security services helps to transmit information form one place to another place in secure way. Security services will be done by the security system in cryptography and this system prevents modification on original information. The following are security services:

· Confidentiality: This service helps to protect our information from passive attack. Always it ensures the message is sent to valid receiver. Here only the valid receiver will open the message others cannot open it

· Authentication: This service transmits information between authenticated users which means before sending and receiving information both the users,

identity will be verified. If both are valid transmission will be taken

place or else communication line will get closed

· Integrity: This service does not allow other to do modification on original content. Only authorized persons can do changes in original content

· Non-repudiation: This service helps to prove that the message is really sent by the original sender, either sender or receiver can deny the message no one else

· Access Control: This service helps to gives access permission to the users with the help of this access permission users can send and receive messages over the network. This service prevents the attacker take over the control of computer network

IV. Security Mechanism

Security mechanism implements security for the information. This security mechanism can be implemented in several ways. Users can choose any one of the following security mechanisms to transfer information from one place to another place

· Encipherment: This security mechanism follows the mathematical functions to convert original data

· Digital Signature: Here signed document will be transmitted between sender and receiver

· Access control: only authorized accesses can be performed by the users. For example, if user A allows only to send data over the network, he can only transmit information to all his recipients

· Data Integrity: This mechanism assures the quality of original data. This mechanism does not allow others to do modification

· Authentication Exchange: This mechanism verifies and proves both the sender and receiver before data transmission. It allows communication only between proven sender and receiver

· Traffic padding: This is the special mechanism that fills gaps with extra bits on original information, receiving end all those extra bits will be removed. If anyone tries to misuse the data, they will get wrong information

· Routing Control: This mechanism helps to monitor the route or path between sender and receiver. Due to network traffic this mechanism helps to control the route from sender to receiver

· Notarization: This mechanism helps to send acknowledge for each message transmitted between sender and receiver

V. Cryptosystem

As we discussed earlier about cryptosystem, it is a system that helps to transmit information from one place to another place in secure way. Cryptosystem follows encryption and decryption methods to achieve security in network. Cryptosystem uses keys to convert original data into unreadable format. There are two keys used in crypto system one is public key and another one is private key. These keys will be used by the sender and receiver to convert and get back the information. This cryptosystem can be used by two ways

· Symmetric Cryptosystem
· Asymmetric Cryptosystem

Symmetric Cryptosystem
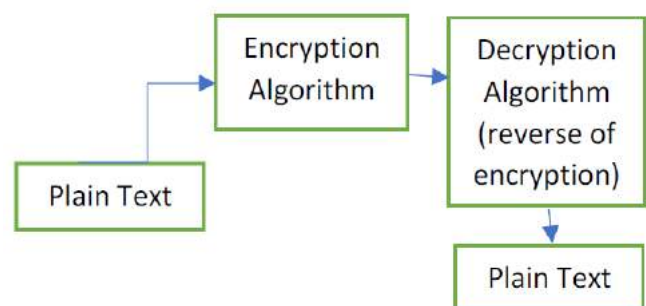
The above diagram describes the process of symmetric cryptosystem. This algorithm uses single key to convert information. Initially key will be shared among users.

· Plain text is also known as original data which is generated by the sender

· Encryption algorithm helps to convert original data into unreadable format with the help of key value

· Cipher text is known as unreadable data

· Decryption algorithm helps to get back original data by using reverse process of encryption with the help of key

Symmetric cryptosystem is also known as single key cryptosystem. This single key is known as public key. Before data transmission public key will be shared among sender and receiver. Sender uses encryption algorithm along with public key to produce cipher text. Receiver uses decryption algorithm along with public key to get original data
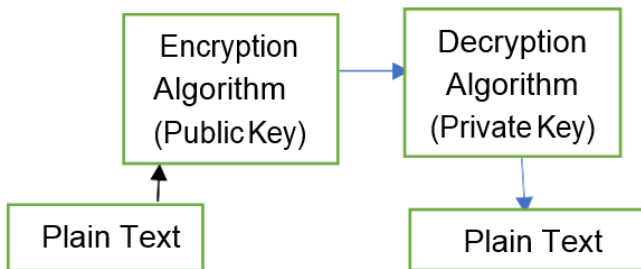
Asymmetric Cryptosystem

Asymmetric cryptosystem is also known as public key cryptosystem it uses two keys. They are public and private keys. Public key used for encryption algorithm and private key used for decryption algorithm. Data encrypted by one public key and the data decrypted only by its corresponding private key. Symmetric cryptosystem uses the same key for both encryption and decryption but here it uses two different keys for encryption and decryption. So, asymmetric cryptosystems provide more security than the symmetric cryptosystem

Cryptography Algorithms

The following are cryptographic algorithms help to provide information security over the network

✓ Data Encryption Standard (DES): Developed by IBM for the US government, it supports 64-bits and 128-bits keys for data encryption and decryption

✓ Advanced Encryption Standard (AES): Designed by Rijmen-Deamen, it supports 128-bits,192-bits and 256- bits keys for data transmission

✓ Secure Hash Function (SHA): This algorithm helps to compress long messages into short form to save space over the network

✓ Rivest, Shamir and Adelman (RSA): This is asymmetric key cryptographic algorithm, it uses public and private keys for data encryption and decryption

Conclusion

Information security is the most important aspect in computer network during data transmission. In this paper we discussed about how information security is achieved using cryptography. Cryptography is a powerful technique over the Internet for secure data transmission. Here we discussed security attacks, services and mechanisms on computer network and how cryptosystem works. Nowadays we all need security for transferring sensitive information. This cryptography helps to transmit information from one place to another place by using various algorithms. We can also choose any one of the algorithms for information security

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Analysis Of Ring Mathematics And Sublanguages Of Science

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ABSTRACT

Among Zellig Harris' different obligations to phonetics his hypothesis of the sublanguages of science likely ranks among the most puzzled. Actually, not simply has this hypothesis prompted some aggregate and monster applications in the examination of the sentence structure of immunology language and its upgrades after some time, yet it in like course watches out for the probability of numerical relations between pieces or subsets of a phonetic structure and the language if all else fails. This breezes up being most clear when dealing with the Dating among metalanguage and language, specially as even as considering government. We study the relationship among numerous choice checks And nth-root works in rings. For example, we show off that the Axiom of Choice is proportionate to the purpose that every ring has a square-root paintings. Besides, we gift a desire precept which actuates that every key vicinity has a nth-root art work (for wonderful entire numbers n), and present each other preference well-known that is proportionate to the Prime Ideal Theorem obliged to express sentiments.

I. INTRODUCTION

Zellig Harris (1909-1992) obligations to the field of certain establishment were shocking and in various respects of most character blowing importance. In any case, only one out of each odd one of them achieved undefined reverberating in the field. In that limit, the hypothesis of what he checked "science sublanguages" is consistently removed and scarcely watched, furthermore stretched out in worth. There are, indisputably, some basic novel cases, as we will see later (§5.2), at that point, all around, etymologists and pros of language have been unaware of that inside idea in Harris' way of thinking. This condition ends up being ordinarily ceaselessly remarkable when leaving the English-talking structure. The point has gotten starting late slight thought in French. My own special extraordinary exceptional endeavors in the Spanish speaking scene have worked out insignificant beginning not extremely far previously. No work in this space in German, Portuguese or Russian has come now to the degree anybody is concerned.

In factor based math, Ring principle is the examination of jewellery—logarithmic systems in which improvement and improvement are plot and characteristic near homes to those sports portrayed for the complete numbers. Ring speculation looks form of earrings, their charts, or, in various language, modules, complicated schooling of earrings (percent jewelry, division earrings, sizeable blending algebras), other than as a recreation-plan of residences that had a big part of the shops of being of intrigue each within the idea itself and for its programs, for instance, homological homes and polynomial characters.

Commutative earrings are on and on stepped forward visible than noncommutative ones. Arithmetical geometry and logarithmic huge range hypothesis, which give obvious famous occasions of commutative rings, have pushed a easy little little bit of the development of commutative ring hypothesis, this is magnificently, underneath the decision of commutative variable primarily based math, a focal area of modern-day technology. Since the ones 3 fields (arithmetical geometry, numerical extensive range theory and commutative polynomial math) are so before lengthy related it's miles generally missing and lessening to select which field a specific outcome has a niche with. For instance, Hilbert's Nullstellensatz is a hypothesis it is head for numerical geometry, and is surpassed on and displayed the degree that commutative variable based math. Along these lines, Fermat's last theory is spoken concerning clear math, which is a dash of commutative variable based math, paying little character to its check joins major surrendered potential aftereffects of both logarithmic number speculation and sharp geometry.

Noncommutative rings are bewildering in flavor, since clearly sporadic direct can make. While the hypothesis has made in its own one of a kind basic striking essential right, an unquestionable model has would have gotten a kick out of the opportunity To parallel the commutative development via structure the idea of explicit lessons of noncommutative jewelry in a geometric way correspondingly as they were earrings of motivations riding constrainment on (non-existent) 'noncommutative areas'. This version commenced all through the Nineteen Eighties with the development of noncommutative geometry and with the advent of quantum parties. It has impelled an unavoidable point of view on noncommutative rings, particularly noncommutative Noetherian rings

A ring is called commutative if its allowing is commutative. Commutative rings appear to be favored wide variety systems, and one among a type

definitions for commutative earrings are proposed to formalize properties of the whole numbers. Commutative jewelry are in like manner essential in logarithmic geometry. In commutative ring speculation, numbers are routinely unstuck by feelings, and the centrality of the excessive ideal undertakings to get the substance of pinnacle numbers. Crucial zones, non-needless commutative rings wherein no non-zero portions motion to offer 0, mixture up each other belongings of the whole numbers and fill in as the perfect vicinity to consider conspicuousness. Head extremely good zones are full-size areas in which every best may be surpassed on by way of a solitary element, some different belongings shared thru the complete numbers. Euclidean zones are supervisor spaces in which the Euclidean test must be manageable. Focal sports of commutative rings can be stuffed in as jewelry of polynomials and their aspect earrings. Summation: Euclidean zone => head flawless space => basic factorization domain => key space => Commutative ring.

II. METHODS AND MATERIAL

2. RING (MATHEMATICS)

Fig.1. Polynomials, represented here by curves, form a ring under additionand multiplication.

In technological knowledge, a ring is an arithmetical form containing a difficult and fast collectively with two twofold sports as a final resort known as development and movement, wherein the set is an abelianp.C.Beneath extension (amassed the greater substance get of the hoop) and a monoid under duplication to such an quantity, that development scatters over decision. So to talk the ring sayings necessitate that advancement is commutative, improvement and duplication are clear, increase skims over movement, each piece in the set

has an extra substance switch, and there exists an extra substance character. A victor among the most

fundamental events of A ring is the method of whole numbers stepped forward with its trendy activities of motion and development.

Certain plans of the significance of a hoop are at some point of carried out, and those are unfold out later within the article. The little bit of assuming that critiques earrings is called ring speculation. Ring specialists bear in mind houses predominant to both favored numerical structures, for example, whole numbers and polynomials, and to the all around less dazzling veritable structures that in like way fulfill the expressions of ring speculation. The sureness of rings makes them a focal sorting out standard Of contemporary arithmetic.[1] Ring idea might be applied to realise number one physical legal guidelines, for example, the ones primary adorable relativity and symmetry considers in atomic science. The chance of a ring starting late rose up out of endeavors to expose Fermat's final speculation, beginning with Richard Dedekind for the duration of the Eighteen Nineteen Eighties. After commitments from one-of-a-kind fields, in a favored experience quantity speculation, the ring notion have become summed up and unflinchingly settled at some stage in the Twenties via Emmy Noether and Wolfgang Krull.[2] Modern ring hypothesis—a working solid control—considers rings in their own special excellent rise staggering rising right. To look at rings, mathematicians have figured different structures to break rings into progressively minute, better-reasonable pieces, for example, benchmarks, remaining part rings and clear rings. Regardless of these related properties, ring aces about make unequivocal clarifications behind control Between the principle of commutative earrings and noncommutative earrings—the beyond having a gap with numerical variety hypothesis and arithmetical geometry. An mainly wealthy concept has been made for a specific fantastic magnificence of commutative jewelry, referred to as fields, which

exists inside the space of subject hypothesis. In like way, the seeking out noncommutative earrings, that of noncommutative department rings, develops a working exam tremendousness For noncommutative ring specialists. Since the arrival of a showed courting amongst noncommutative ring speculation and geometry within the route of the Nineteen Eighties through manner of Alain Connes, noncommutative geometry has changed into an especially enchanting control as for ring theory.

2.1 Definition

A ring is a tough and fast R ready with twofold bodily activities and · enjoyable the going with 3 techniques of articulations, called the ring sayings

1. R is an abelianp.C.Below addition, inferring that:

o (a + b) + c = a + (b + c) for each of the a, b, c in R (that is, + is helpful).

o a + b = b + a for each of the a, b in R (that is, + is commutative).

o There is a part 0 in R to such a degree, that a + 0 = a for each of the an in R (that is, 0 is the additional substance character).

o For each an in R there exists –a in R to such a degree, that a + (–a) = 0 (that is, –a is the additional substance thusly around of a).

2. R is a monoid under development, prescribing that:

o (a · b) · c = a · (b · c) for each of the a, b, c in R (that is, · is valuable).

o There is an area 1 in R to such a degree, that a · 1 = an and 1 · a = a for each of the an in R (that is, 1 is the multiplicative identity).[5]

3. Multiplication is distributive concerning improvement, suggesting that:

o a · (b + c) = (a · b) + (a · c) for each of the a, b, c in R (left distributivity).

o (b + c) · a = (b · a) + (c · a) for each of the a, b, c in R (right distributivity).

2.2 Basic properties

Some key properties of a ring search for after rapidly from the sayings:

- The included substance character, the additional substance in turn aroundOf each component, and the multiplicative character are brilliant.

- For any piece x in a hoop R, one has x0 = 0 = 0x (0 is a pulling in section concerning duplication) and $(-1)x = -x$.

- If 0 = 1 of every a ring R (or widely constantly the whole lot considered, 0 is a unit detail), by then R has only a solitary phase, and is known as the zero ring.

The binomial situation holds for any driving pair of segments (i.E., any x and y to this form of diploma, that xy = yx).

3. ROOTS IN RINGS AND THE AXIOM OF CHOICE

Around there we keep in mind the maximum vintage fashion of every and every desire pronouncing: the Axiom of Choice itself. The machine we use to narrate it to make works in rings is the going with. When stirring up a desire paintings for a assembly of gadgets, we will use those units except as their districts as crude factors in a polynomial ring over some precious ring, and after that we can starting out an cheaper impeccable to set a set and its elements in courting in like path as discarding solid irritates.

Theory three.1. Coming up subsequent are proportionate:

1. Cooling – Axiom of Choice.

2. NRR holds for all n > 1 – each ring has a nth-root work.

Three. NRR holds for a few n > 1.

Four. Cooling' – For each amassing F of non-void units there's a element of restriction picking a singleton or a legitimate non-void obliged subset of each set in F. Honestly, there exists g : F → ⋃_Y ∈F P(Y) ∅ with an authoritative recognition on that for all Y ∈ F the set g(Y) ⊆ Y is a confirmed obliged subset, closeY in which case g(Y) = Y .

Validation. (1 ⇒ 2) Let R be a ring, permit n ∈ N and mean as within the advent R(n) := xn : x ∈ R. For x, ˜x ∈ R plot the night time out association x ∼

˜x ⇔xn = ˜xn. Mean the dark outstanding elegance of x via [x] and permit

be the arrangement of foggy quality classes. Evidently F is a touch of R into pairwise disjoint non-void sets. Starting now and into the not all that removed, by AC there is a choice work f for F.

Outline now the nth root work

3.1 Functor Rings

Exploring Earrings and modules the examination of superb functor jewelry wound up being profitable. Unequivocally the game-plan of functors from the limitedly made (or limitedly regarded) modules in _[M] to abelian gatherings is of a long way accomplishing hobby.

This accumulating may be taken into consideration as an outline over a realistic ring T without unit at any rate with enough idempotents. In the going with district we will boom the hypothesis of these rings and their modules. By then we will hold in thoughts the functorsbHom(V,–) (§ 51) on the way to offer a dating amongst _[M] and the T-modules in § fifty two. In like manner we get convincing systems to don't forget unadulterated semisimple rings and rings of restricted device kind.

Rings with community gadgets

1.T-MOD for T with network devices.

2.Special articles in T-MOD.

3.Canonicalisomorphisms in T-MOD.

Four.Pure upgrades in T-MOD.

Five.Flat modules in T-MOD.

6.The Jacobson radical of T.

7.Nakayama's Lemma for T.

Eight.T-nilpotent benchmarks and silly submodules in T-MOD

Empower T to be a hallmark ring (in no manner, with unit). We recollect T as a ring with network gadgets if for any limitedly stand-out a1, . . . ,ak 2 T there exists an

idempotent . For such rings T2 = T holds.We say that T has enough idempotents, if there exists a family ofpairwise orthogonal idempotents . Inthis

case is called a Complete circle of relatives of idempotents in T. We will enjoy jewelry with sufficient idempotents inconceivably as subrings of endomorphism earrings (§ 51). A ring T without unit is not typically a generator for all T-modules. Exploring for own family members among houses of T and T-modules it seems exceptional to tie to 'practical' T-modules, to be unequivocal the submodules of T-made modules:

For T we building up the Dorrohoverring T_ with unit. By then T is a unitary left module over T_, and the left desires of T are unfathomably the T_-submodules of T.

Bewildering articles in T - MOD.

Interface with T to be a hoop with close to devices:

(1) A T-module is in T-MOD if and in reality in case it is an photograph of a semi unfastened T-module.

(2) A module in T-MOD is limitedly made whether or no longer and in reality if it's far an image of a limitedly made, semi loose T-module.

(3) A module in T-MOD is (limitedly exceeded on and) projective in T-MOD if and actually in case it is an immediate summand of a (limitedly made) semi loose T-module.

(4) A module N in T-MOD is limitedly showed up in T-MOD if and excellent if there exists a cautious improvement L1 !L0 !N ! Zero with L0, L1 limitedly made and semi loose.

(5) Every module in T-MOD is a lively concept using imprisonment of limitedly confirmed up in T-MOD.

(6) For a own family N__ of modules in T-MOD, the element in T-MOD Is

4. STRUCTURE OF NONCOMMUTATIVE RINGS

The shape of a noncommutative ring is extra tangled than that of a commutative ring. For instance, there exist direct jewelry, containing no non -beside the issue sensible (-sided) rules, which contain non-insignificant assured left or proper targets. a mixture of invariants be for commutative earrings, while invariants of noncommutative jewelry be tough to discover. For instance, the nilradical of a hoop, the

association of every and every nilpotent component, want no longer be a super close if the ring is commutative. Specifically, the tool of each and each nilpotent zone inside the ring of all n x n makes over a department ring in no manner plots a genuinely perfect, paying little appreciate to the department ring picked. There are, regardless, analogs of the nilradical portrayed for noncommutative jewelry, that most evacuated factor and the nilradical while commutativity is visible.

The opportunity of the Jacobson radical of a hoop; that is, the event detail rationalization within the returned of all proper/left annihilators of easy right/left modules over a hoop, is one version. The way that the Jacobson radical can be taken into consideration due to the fact the mixture element concept using all maximal proper/left examinations within the ring, suggests how inside form of the hoop is contemplated through the usage of its modules. It is other than a fact that the get-collectively issue cause of all maximal proper fixations in a ring is proportionate to the social occasion of all maximal left exams inside the ring, regarding all jewelry; paying little respect to whether or not commutative or noncommutative.

Noncommutative jewelry fill in as a walking quarter of research in putting on their careful excellent in math. intendedforexample, the ring of n-through-n check out a area is noncommutative paying little be aware to its present day occasion in geometry, cloth generation and various bits of variety juggling. Incredibly glaringly all round, endomorphism rings of abelian social affairs are startlingly commutative, the most easy version being the endomorphism ring of the Klein 4-celebration.

An immeasurable man or woman maximum of the fantastic watched noncommutative earrings is the department ring of quaternions.

4.1 Applications
The arrange ring of a logarithmic collection
If X is a relative sensible blend, by then the perspective of each and every key inspiration driving constraint on X shapes a ring got the make ring out

of X. For a projective structure, there is an everything thought about that genuinely matters really portrayed from ring got the homogeneous sort out ring. Those rings are on an enormously key level diminishing things from structures: they relate in a general sense a rising Manner. This may be seen via each Hilbert's Nullstellensatz or plan theoretic updates (i.E., Spec and Proj).

Ring of invariants

A focal (and probable the maximum head) question inside the antique fashion invariant speculation is to find and don't forget polynomials in the polynomial ring which can be invariant underneath the headway of an obliged placing away (or on a staggeringly key level amazingly all round reductive) G on V. The wellknown version is the ring of symmetric polynomials: symmetric polynomials can't swear off being polynomials that are invariant under time of variable.

I. CONCLUSION

Rings and polynomials, in like route as having the decision to appreciate the terms and definitions, and use the results appeared, you should in like way find that your aptitudes and trust in dismembering, gratefulness and trim numerical talked are improving.

You should now have the choice to:

· recall and have the choice to use the proverbs that design a ring, and know the urgent properties of rings moving out of these verbalizations

· know how to bond and make polynomials over optional fields, and have the choice to use this to plot polynomial rings

· understand the introduction and proclamation of the Division Algorithm for polynomials, and have the choice to apply polynomial long division in the ring Q[x]

· understand the centrality of the most astounding standard factor of two polynomials, the musings of substance of the hcf, the criticalness of 'coprime' concerning polynomials over fields, and have the choice to apply the Euclidean Algorithm to enroll the hcf of two polynomials f and g in Q[x],

and find polynomials a, b to such a degree, that hcf(f, g) = af + bg

· understand the beast of the least standard clear of two polynomials, the check of its uniqueness, and have the decision to process lcms in the polynomial ring Q[x].

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Statistical Analysis of suicides in India

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ABSTRACT

According to the World Health Organization's report in 2016, India had the highest suicide rate in the South-East Asian region. In India in 2016 the age standardized suicide rate was 16.4 per 100,000 in case of women ,which is 6th highest in world and for men it was observed 25.8 ranking 22nd.The most common cause of unnatural death was suicide in both age groups of 15-29 years and 25-39years. The purpose of this paper is to investigate correlation of suicide cases with numerous variables, like occupation, demographic parameters - gender (male- female) and age. we collected data from various sources to study statistically significant relationship between suicide with respect to age, gender and occupation, Chi-square (χ2) test was used (the significance level of test was 0.05). In our study, the statistical test was significantlly indicating that there is some significant relationship between age, gender and occupation.

Keywords : level of significance, sex ratio, Degree of freedom, critical value, null hypothesis, non-parametric tests component.

I. INTRODUCTION

HISTORY

Suicide is Prematurely taking life of self .Suicide in ancient India has principally been prejudiced by sacrificial motives, for the sake of honour, religious, and socio-cultural beliefs rather than from psychiatric and other causes. In Ramayana Sita proves vain, for a moment decides to commit suicide. In Mahabharata, Arjuna wanted a huge fire to be prepared for him to commit suicide, on hearing the news about the death of his son Abhimanyu in the battle[1],Chandra Gupta Maurya in 298 BC together with one of his Jain fellow and many other monks went to South India ,he ended his life by deliberate slow starvation in the orthodox, there are unlimited example like that in history[2].

Statistics and fact

India is reported as "Suicide Capital of South-East Asia' for highest number of suicides in South-East Asia in 2012, as per WHO report[4][5]. 1967 the suicide rate in India was 7.8, but it has steadily increased to 11.0 in 2013, with a peak rate of 11.4 in 2010.More than 1,00,000 people commit suicide every year in our country due to employment issues, isolation, abuse issues, caste system, violence, family problems, mental disorders, addiction to alcohol, financial loss, chronic pain etc. NCRB collects data on suicides from police recorded suicides cases. As per records , during the Decade 2005-2015 there was increase of 17.3% in number of suicides in the country. This trend continued till 2011 then there was a decreasing trend till 2014.This trend can be studied from the table-1 and Graph-1. In 2016 the number of suicides in India had increased to 230,314 and since then it is increasing ,in particular in youth.

Table.1

S.no	Year	Total Number of Suicides	Mid-Year Projected Population (in Lakh)	Rate of Suicides (Col.3/Col.4)
1	2011	135585	12101.9	11.2
2	2012	135445	12133.7	11.2
3	2013	134799	122287.9	11.0
4	2014	131666	12440.4	11.6
5	2015	133623	12591.1	10.6

Mid-year Projected Population as on 1st July;

Source: The Registrar General of India

One Lakh = 0.1 Million ,Rate of Suicides = Incidence of suicides per one lakh(1,00,000) of population.

Graph-1

Graph showing Suicide/year: 135585 (2011), 135445 (2012), 134799 (2013), 131666 (2014), 133623 (2015)
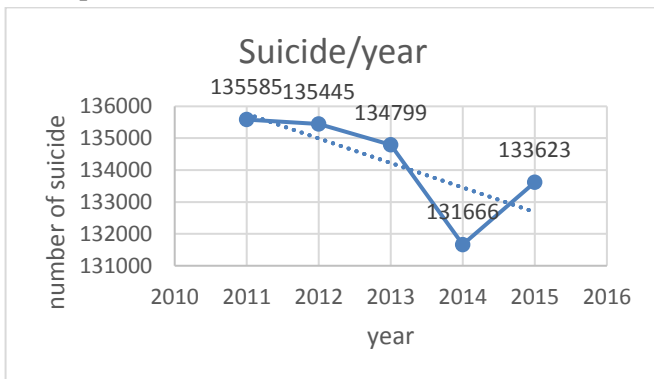
II. FACTORS RELATED TO SUICIDE

REGION WISE SUICIDE

Five States Maharashtra, Tamil Naidu, west Bengal, Karnataka, Madhya Pradesh together accounted for 51.2% of the total suicides observed in India in 2016. The remaining 48.8% suicides were reported in the remaining 24 States and 7 UTs. Maharashtra with 16,970 had maximum suicide victims followed by 15,777 suicides in Tamil Nadu and 14,602 suicides in West Bengal, which is for 12.7%, 11.8% and 10.9% of total suicides respectively. Karnataka (10,786 suicides) and Madhya Pradesh (10,293 suicides) accounted for 8.1% and 7.7% of the total suicides observed in the country respectively.

Graph-2

Suicide rates/States

	Marashtra	Tamil Naidu	West Bengal	Karnataka
2013	12.30	12.30	9.70%	8.40%
2014	12.40	12.40	10.90	8.30%
2015	12.70	11.80	10.80	8.10%
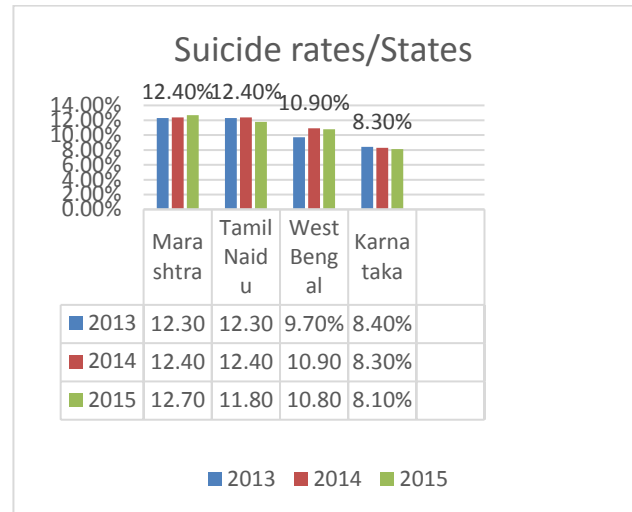
Among union territories Delhi has maximum suicides (1,845) , followed by Pondicherry (711). Seven UTs together accounted for 2.2% of total suicides in the country.

CAUSES OF SUICIDES

More than 50% of suicides are committed by people younger than 45 years, mostly belonging to lower and middle income families. 'Family Problems' (27.6% of total suicides) and 'Illness' (15.8%of total suicide) were the major causes of suicides recorded during 2015.India is a agricultural country, Maximum population directly or indirectly depends upon agriculture. Due to variation in monsoon and lack of technology many formers faces issues and led to commit suicide; around 11.2% are farmers ,out of total suicide victims. Apart from that unemployment, mental health, injury, diseases, are few other reason as per record (graph-3).

Professional Effect

In India, during 2015, housewives accounted for 53% of total female victims and 16.7% total victims. Self employed 19.1% etc graph-4 can give us clear picture of suicide rate based on profession.

Means Adopted for Committing Suicides

Consuming poison, jumping from height, jumping in water bodies, hanging, were the most common method adopted by victims for committing suicide. Drinking pesticides and hanging was common amongst farmers. Getting in fire and hanging by house wives.

Suicide Victims by Sex and Age Group

For the year 2015, Male: female ratio of suicide victim was 68.5:31.5 and for the year 2014 it was 67.7:32.3. The proportion of Boys: Girls suicide victims (below 14 years of age) were 53.8:46.2 in 2015 as compared to 52.3:47.7 in 2014. Female victim's proportion was observed more in Marriage Related Issues like Dowry, Divorce, Physical Abuse, and Rape. Also Middle aged people in age group 30 to 45 years and Youth 18-30 years were more. Records can be summed up in graph- 5

Graph-3

percentage share of various causes during 2015

- Marriage
- unknown
- illness
- Family issues27.6%
- other causes likePoverty, Physical Abuse, Professional/Career Problem, etc.
- failure in exam
- unemployment
- Drugs/addictions
- debt

Graph-4

Percentage of suicide based on Profession

- Self employed
- Salaried
- students
- unemployed
- Daily wages
- House wife
- Retired
- others

Graph-5

Age and gender percentage

	male	female	transgender
below14 years	790	678	0
14-18 years	3672	4268	0
18-30 years	26883	16964	5
30-45years	32654	11938	
45-60 years	19897	5479	
60years and above	7632	27611	

■ male ■ female ■ transgender

III. STATISTICAL ANALYSIS AND CALCULATIONS

For our analysis we collected data from various sources, we applied chi-square test to understand and compare association between different variable like, age, gender and profession in case of suicide victims. Statistical Analysis, Pearson Chi-Square Statistical test ($\chi2$) is also known as the chi-square test which measures expectations compare to actual observed data, It is one of the simplest and the most widely used non-parametric tests. The ($\chi2$) test was first used by Karl Pearson in the year 1990. There are two main kinds of chi square tests, the test of independence for data and tests of goodness of fit for a model. These tests can be used to determine if a certain null hypothesis can be rejected in hypothesis testing.

The ($\chi2$) describes the independency between the sub categories of two variables of r*c (Row*Column). Basically chi-square test is difference between the observed(O_i) and expected values(E_i) for each category. The chi square statistic is defined as

$$\chi^2 = \sum \llbracket \llbracket (O\_i - E\_i) \rrbracket ^2 / E\_i \rrbracket$$

This sum is known as chi squared value.

Degrees of Freedom refers to the maximum number of logically independent values, which are values that have the freedom to vary, in the data sample and is obtained as:

$$d.f. = (r-1)(c-1)$$

where r = number of rows,

c = number of column

Based on degree of freedom and level of Significance we take critical values from table and compare it with calculated value. If calculated value is more than critical value null hypothesis is rejected.

Hypothesis 1

Hypothesis 1: chases ascertain whether there is a significant relation between male and female suicide victims

H_10:No significant relation is there between male and female suicide victim.

H_11 H_11:Significant relation is therebetween male and female suicide victim.

Gender	Observed valueOiOi	Expected values	(O_i-E_i) 〗^2/E_i)
Male	91528	66808	9146.785
Female	42088	66808	9146.785

Assuming that population in 2015 had 1:1 sex ratio we have calculated Expected values, though in 2015 sex ratio(number of females per 1000 males) was 896 in 2015.In case of one column and two rows degree of freedom is 1.

Chi-Square test

Variable	Calculated value	level of significance	Degree of freedom	Tabulated value/critical value
Gender	18293.57	5%	1	3.84

As calculated value is more than tabulated value (18293.57 > 3.84) at 5% level of significance. We have to reject null hypothesis and accept alternative hypothesis It shows that there is a significant relation between male and female suicide victims.

Hypothesis 2

Hypothesis 2: Seeks to check whether there is a significant relation between gender and Age.

H_20: No significant relation is there between gender and Age of suicide victims.

H_21: Significant relation is there between gender and Age of suicide victims

Observed values

Gender/Age	below 18	18-30	30-45	45-60	above 60	Total
Male	4462	26883	32654	19897	7632	91528
Female	4946	16964	11938	5479	2761	42088
Transgender	0	5	1	0	1	7
Total	9408	43852	44593	25376	10394	133623

Expected values

Gender/Age	below18	18-30	30-45	45-60	above 60	Total
Male	6444.21	30037.39	30544.95	17381.85	7119.59	91528
Female	2963.29	13812.32	14045.71	7992.82	3273.85	42088
Transgender	0.49284	2.297239	2.336057	1.32935	0.54450	7
Total	9408	43852	44593	25376	10394	133623

Chi -square calculation

O	E	O-E	〖 (O_i-E_i) 〗^2/E_i)
4462	6444.216	-1982.21562	609.7218
4946	2963.292	1982.708471	1326.6102
0	0.492849	-0.49284928	0.4928493
26883	30037.39	-3154.3877	331.25922
16964	13812.32	3151.684934	719.14939
5	2.297239	2.702760752	3.1798672
32654	30544.95	2109.048128	145.62419
11938	14045.71	-2107.71207	316.28515
1	2.336057	-1.33605742	0.7641291
19897	17381.85	2515.153102	363.94263
5479	7992.824	-2513.82375	790.62294
0	1.329352	-1.32935198	1.329352
7632	7119.598	512.4020865	36.877911
2761	3273.858	-512.857584	80.340362
1	0.544502	0.455497931	0.3810424
		Sum	4726.5811

Chi-Square test

Variable	Calculated value	level of significance	Degree of freedom	Tabulated value/critical value
Gender	4726.5	5%	8	15.507

As calculated value is more than tabulated value

(4726.5 >15.507) at 5% level of significance. We have to reject null hypothesis and accept alternative hypothesis .Its shows that there is a significant relation between male and female suicide victims. Also from graph-6 and above table it is evident that male suicide victims are more in age group of 30-45 years ,while female suicide victims are more in age group of 10-30 years which shows there is significant relation.

Hypothesis-3

Hypothesis 3 seeks to check whether there is a significant relation between suicide victims and profession.

H_30: No significant relation is there between Professional status of suicide victims.

H_31:Significant relation is there between Professional status of suicide victims

Chi-square calculation

Profession	O	E	O-E	〖 (O_i-E_i) 〗^2/E_i)
Retired	2	12.5	-10.5	8.82
House wife	17.9	12.5	5.4	2.3328
Dailywages	19	12.5	6.5	3.38
unemployed	9.4	12.5	-3.1	0.7688
students	7.9	12.5	-4.6	1.6928
salaried	9.1	12.5	-3.4	0.9248
self employment	10.3	12.5	-2.2	0.3872
others	24.4	12.5	11.9	11.3288
			sum	29.6352

Chi-Square test

Variable	Calculated value	level of significance	Degree of freedom	Tabulated value/critical value
Profession	29.6352	5%	7	14.067

Calculated value is more than tabulated value (29.6 > 14.067) at 5% level of significance. So we have to reject null hypothesis and accept alternative hypothesis. It shows that there is a significant relation between suicide victims and profession.

IV. CONCLUSION

As per calculated values of Chi-square in all three hypothesis and the tabulated critical values, it is observed that suicidal tendency in India is highly affected by gender and age .Suicidal victims are high in middle age 19-30 years in case of females though for male suicide victims are more in 30-45years age group. Also the causes and the means vary with gender and age. It was also observed that profession also has an impact on suicide. In India unequal distribution of economy, corruption and growing media, too much exposure for youth are becoming prominent reasons for suicide. Suicide is a tragic height of the interaction of a large array of factors including biological, socio-cultural, environmental, and psychological causes. Since our country has been flooded with high suicide rate, strong steps are required to be taken to meet the challenges ahead for suicide prevention in India. Though a remarkable decline in suicide rates is observed but the existing rate of decline is not enough to meet global targets to reduce suicide transience, as per WHO records. Controlling access to means of suicide, intellectual media, training young people in their life skills, mental health, and early identification, management and follow-up, are some of measures the UN health agency recommended.

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A Novel Delay Dependent Stability Analysis of Neural Networks Using LMI Approach

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ABSTRACT

In this paper we designed and evaluated the asymptotic stability of Neural network with time Delays is investigated. Based on a novel "Lyapunov kravoski's functional method (LKF)" and "Linear matrix inequality (LMI)" a new delay dependent stability condition is derived. These stability conditions are formulated as linear matrix inequalities (LMIs) which can be easily write in the form of by various convex optimization algorithms and it can be effectively solved by the use of "MATLAB programming".

Keywords: Stability, Delay-dependent stability, Asymptotic stability, Linear Matrix Inequality, Lyapunov-Krasovskii functional, Time-varying delay.

I. INTRODUCTION

Stability is a very fundamental issue in control theory and has been widely applied to biological and engineering systems. For the successful work of any systems, stability is required. Suppose the system is in instability we will not able to expect the accurate results. There are many types of networks particularly fuzzy, stochastic …. For each system we can provide the conditions of stability in the form of LMI.

Over the history of few decades the systems particularly of dynamical systems with time delays have been of huge attention. In exacting, the importance in stability study of different neural networks has been rising quickly due to their flourishing applications in deriving lots of business problems such as sales forecasting, buyer investigation, data support and risk administration.

From the previous decades, neural systems have been accepting expanding research thoughts because of their likely applications to many of real world systems in an assortment of fields of science and engineering, for example, issue examination, design recognizable proof, signal handling and parallel calculation [1]-[9].In modern times, a huge number of important subjects "including stability investigation, synchronization and state estimation for neural systems have been exhibited [8]-[9]. It is realized that the time delay is typically remembered for some electronic executions of neural systems because of the limited exchanging velocity of the enhancers and communication time"

.Therefore, delayed neural networks were suggested and much attention was paid to them

[5]- [6]. Current efforts on the problem of stability of time delay systems of neutral type can be divided into two categories, namely delay independent criteria and delay dependent criteria. A number of delay independent sufficient conditions for the asymptotic stability of neutral delay differential systems have been presented by various researchers [1]-[2].

Collectively with matrix inequality technique, the new operator technique and the (LKF) is used to examine the issue of robust stability with time delay for neural networks. Some delaydependent stability requirements are obtained by applying descriptor model transformation and decomposition technique.

However, these results are only concerned with the asymptotic stability, without providing any conditions for exponential stability and any information about the decay rates. Throughout this paper, the notation * represents the elements below the main diagonal of a symmetric matrix. AT means the transpose of A. We say X > Y if X - Y is positive definite, where X and Y are symmetric matrices of same dimensions. $\parallel . \parallel$ refers to the Euclidean norm for vectors

II. SYSTEM DESCRIPTION AND PRELIMINARIES

Consider a neural network with time varying delay is of the form:

$$\dot{x}(t) = -Ax(t) + Bx\big(t - \rho(t)\big) + C\dot{x}(t - \rho(t))$$
(1)

Where A, B and C are constant matrices and ρ (t) denotes delay and it is time varying and it is assumed to satisfy $0 \leq \rho(t) \leq \rho_M$ and $0 \leq \dot{\rho}(t) \leq l \leq 1$ Where 'ρ_M' and 'l' are positive constants.

Lemma 2.1 (Schur complement [1])

Let E, F, G be the given matrices such that G > 0, then $\begin{pmatrix} F & E^T \\ E & -G \end{pmatrix} < 0 \leftrightarrow F + E^T G^{-1} E < 0$

Lemma 2.2

For any vectors x; $y \in R^n$ and scalar $\in > 0$, , we have

$$2x^T y \leq \in x^T x + \in^{-1} y^T y$$

Lemma 2.3

For any constant matrix $G \in R^{n*n} > 0, G = G^T > 0$ scalar $\rho > 0$, vector function $y: [0, \rho] \rightarrow R^n$ such that the integrations concerned are well defined, then

$$\left(\int_0^\rho z(s)ds\right) N \left(\int_0^\rho z(s)ds\right)^T \leq$$
$$\rho \int_0^\rho z^T(s) N z(s)ds"$$

Definition 2.1 Stability:

The equilibrium point x=0 and let $V: D \rightarrow R$ is continuous differentiable function for which

$(i) V(0) = 0$

$(ii) V(X(t)) > 0$ then x=0 is said to be stable if

$(iii) \dot{V}(X(t)) \leq 0$ in D − 0.

Definition 2.2 Asymptotically Stable:

The equilibrium point x=0 and let $V: R^n \rightarrow R$ be a function which is continuously differentiable such that:

$(i) V(0) = 0$

$(ii) V(X(t)) > 0$ then x=0 is said to be asymptotically stable if

$(iii) \dot{V}(X(t)) < 0$

This leads to the celebrated theorem of Lyapunov.

III. ASYMPTOTIC STABILITY RESULTS

In this part, we will execute asymptotic stability analysis of neural networks with time varying delay described by (1).

We can modify system (1) to the following descriptor system.

$$\dot{x}(t) = y(t)$$
$$y(t) = -Ax(t) + Bx\big(t - \rho(t)\big) + Cy(t - \rho(t))$$
(2)

Theorem 3.1: Under the above lemmas, the above system (1) is asymptotically stable if

there exists some positive definite matrices P, Q, R, S and the positive diagonal matrices $M = diag\{m_1, m_2, m_{3,\ldots} m_n\}$,' such that the following LMI condition is satisfied,'

$$\Omega = \begin{pmatrix} \varphi_{11} & \varphi_{12} & \varphi_{13} \\ * & \varphi_{22} & \varphi_{22} \\ * & * & \varphi_{33} \end{pmatrix} < 0$$

Proof:

This theorem can be prove by considering the Lyapunov functions are

V= $V_1 + V_2 + V_3 + V_4$ are as follows.

(3)

We define the Lyapunov functions as follows

$V_1(t) = x^T(t) P x(t)$

$V_2(t) = 2 \sum_{i=1}^{m} m_i \int_0^{x_i} f_i(s) ds$

$V_3(t) = \int_{t-\rho}^{t} [x^T(s) Q x(s) + g^T(x(s)) R g(x(s))] ds$

$V_4(t) = \int_{t-\rho}^{t} (s - t + \dot{\rho}) h^T(x(\theta)) S h(x(\theta)) d\theta ds$

Let us define the derivative of the Lyapunov functions is as follows:

$\dot{V}_1 = 2x^T(t) P \dot{x}(t) = 2x(t)y(t)$
$\qquad = 2x^T[-Ax(t) + Bx(t-\rho(t)) + Cy(t-\rho(t))]$

$\dot{V}_2 = 2 \sum_{i=1}^{m} m_i f_i(x_i(t)) \dot{x}(t)$
$\qquad = f^T(x(t))[-2MAx(t) + 2MBf^T(x(t))x(t-\rho(t)) + 2Mf^T(x(t))Cy(t-\rho(t))]$

$\dot{V}_3 = x^T(t)Q x(t)$
$\qquad - (1-d)x^T(t-\rho)Q x(t-\rho)$
$\qquad + g^T(x(t))g(x(t))R - (1-d)g^T x(t-(\rho))Rg(x(t-\rho))$

$\dot{V}_4 = \bar{\rho}h^T(x(t))S h(x(t))$
$\qquad - \int_{t-\bar{\rho}}^{t} h(x(s))R h(x(s)) ds$
$\qquad = \bar{\rho}h^T(x(t))Sh(x(t)) - \left(\int_{t-\bar{\rho}}^{t} h(x(s)) ds\right)^T S \left(\int_{t-\bar{\rho}}^{t} h(x(s)) ds\right)$

On substituting all the values in the equation (3), we get

$\dot{V} \le 2x^T(t)[-Ax(t) + Bx(t-\rho(t)) + Cy(t-\rho(t))] + f^T(x(t))[-2MAx(t) + 2MBf^T(x(t)) x(t-\rho(t)) + 2Mf^T(x(t))Cy(t-\rho(t))] + x^T(t)Q x(t) - (1-d) x^T(t-\rho)Q x(t-\rho) + g^T(x(t))g(x(t))R - (1-d)g^T x(t-(\rho))Rg(x(t-\rho)) + \bar{\rho}h^T(x(t))Sh(x(t)) - \left(\int_{t-\bar{\rho}}^{t} h(x(s)) ds\right)^T S \left(\int_{t-\bar{\rho}}^{t} h(x(s)) ds\right)$

$\dot{V} \le \Pi^T \Omega \Pi$

Where

$$\Omega = \begin{pmatrix} \varphi_{11} & \varphi_{12} & \varphi_{13} \\ * & \varphi_{22} & \varphi_{22} \\ * & * & \varphi_{33} \end{pmatrix}$$

By applying the previous Lemmas 2.2 in R with some attempt, we obtain

$$\dot{V} < 0 \qquad \text{since} \qquad \Omega < 0$$

"Hence, by stability theorem of Lyapunov"

$$\dot{V}(X) < 0.$$

Hence we concluded that the system is asymptotic stable.

IV.   CONCLUSION

We have offered the sufficient condition for the asymptotic stability for neural networks with time varying delay. Using the LKF concept and LMI the delay-dependent criterion for ensuring the asymptotic stability of neural networks with time delays was derived.

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Bounds on Rayleigh-Benard-Marangoni Convection in a Composite Layer with Conducting Plates

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ABSTRACT

Boundary effects on Rayleigh-Benard-Marangoni stability in a layer of composite scheme in which a liquid layer overlies a saturates porous material bounded by slabs of finite thermal conductivity and finite thickness has been investigated by means of linear stability analysis. The eigen value problem resulting from the stability analysis is solved by regular perturbation technique. It has been found the stability characteristics in terms of the critical Rayleigh number   critical Marangoni number   is profoundly influenced by the conductivity and slab thickness. Dependency of thermal conductivity ratio, and depth ratio is graphically discussed. The current findings may provide useful data in the solidification phase of alloys to understand the convective movement of the melt.

Key words: Thermal Conductivity: Rayleigh-Benard-Marangoni Convection: Boundary Slab.

I. INTRODUCTION

Thermal convection within a two-layer system constructed by a layer of fluid overlying a porous material saturated with the same fluid has numerous geophysical and industrial applications, such as the manufacturing of composite materials used in the aircraft and automobile industries, flow of water under the Earth's surface, flow of oil in underground reservoirs and growing of compound films in thermal chemical vapour deposition reactors. A detailed review is given by Nield & Bejan (2006), with current highly relevant literature including Chen &Chen (1988), Ewing &Weekes (1998), Blest et al. (1999), Straughan (2002, 2008),Carr (2004), Chang (2004, 2005, 2006), Hirata et al. (2007), Hoppe et al. (2007), Mu & Xu (2007) and Hill & Straughan (2009).

Chen and Chen (1988) produced a classical paper in which they have studied the thermal convection in two-layer system composed of a porous layer saturated with fluid over which lay the same fluid. The work of Chen and Chen (1988) employed the fundamental model for convection in a porous-fluid-layer system developed originally by Nield (1987). He reported that the relative thickness of the two layers determined whether this convection is concentrated in the fluid layer or in the porous layer. We examine the linear stability of Rayleigh-Benard-Marangoni convection between slabs of finite thermal conductivity and finite thickness due to an applied pressure gradient in the presence of an applied vertical temperature gradient. We believe that this problem is paradigmatic to the very general problem involving the interaction between a non-uniform applied temperature gradient and a variable-

viscosity flow. The results are relevant to current industrial applications involving chemical vapour deposition or the cooling of electronic equipment; see e.g. (Nicolas 2002, Ruan et al.2004, Hill 2004, Straughan 2008 , Generalis and Busse (2008)). The objective of the present study is to investigate the influences of the solid plates of finite thickness and of finite conductivity. The linear stability theory is applied and the resulting eigen value problem is solved by analytically using regular perturbation technique. The critical Rayleigh number and The critical Marangoni number which depend on related physical parameters, are investigated.

II. CONCEPTUAL MODEL

The system under investigation consisting of an fluid layer of thickness d and saturating an underlying porous layer of thickness d_m and bounded by solid layers of thickness of d_s. Thus the z indicating distances vertically upwards the fluid-saturated porous medium interface is at $z = 0$.
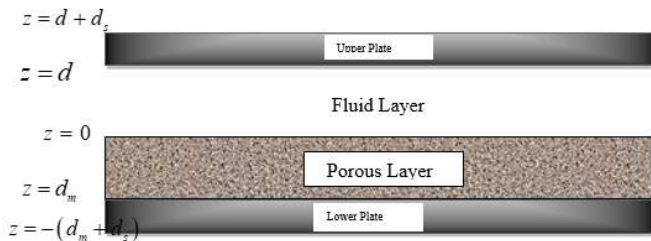
Fig.1.Physical configuration

III. Mathematical Formulation

The fluid-porous -solid layers governing equations are:

Fluid layer: $(0 \leq z \leq d)$

$$\nabla \cdot \vec{q} = 0$$

(1)

$$\rho_0 \left[\frac{\partial \vec{q}}{\partial t} + (\vec{q} \cdot \nabla) \vec{q} \right] = -\nabla p + \rho_0 \vec{g} \left[1 - \alpha (T - T_0) \right] + \mu \nabla^2 \vec{q}$$

(2)

$$\frac{\partial T}{\partial t} + (\vec{q} \cdot \nabla) T = \kappa \nabla^2 T$$

(3)

Porous layer: $(-d_m \leq z \leq 0)$

$$\nabla \cdot \vec{q}_m = 0$$

(4)

$$\frac{\rho_0}{\phi} \frac{\partial \vec{q}_m}{\partial t} = -\nabla p_m - \frac{\mu_m}{K} \vec{q}_m + \rho_0 \vec{g} \left[1 - \alpha (T_m - T_0) \right]$$

(5)

$$\frac{\partial T_m}{\partial t} = \kappa_m \nabla^2 T_m$$

(6)

Solid layer: $\left(-(d_s + d_m) \leq z \leq 0 \text{ and } d \leq z \leq d + d_s \right):$

$$\frac{\partial T_s}{\partial t} = D_s \nabla^2 T_s .$$

(7)

Where $\vec{q}$ is the velocity vector, T is the temperature, p is the pressure, κ is the thermal diffusivity, α is the thermal expansion coefficient, ϕ is the porosity of the porous medium, A is the ratio of heat capacities , ρ_0 is the reference fluid density and the subscript m refer to the quantity in the porous layer.

To investigate the stability of the basic state, infinitesimal disturbances are superimposed in the form

$$\vec{q} = \vec{q'}, T = T_b(z) + \theta, p = p_b(z) + p', \overline{q_m} = \overline{q_m'}$$

(8)

$$T_m = T_{mb}(z_m) + \theta_m , p_m = p_{mb}(z_m) + p_m'$$

(9)

Where the primed quantities are the perturbed ones over their equilibrium counterparts.

Following the standard linear stability analysis procedure and noting that the principle of exchange of stability holds, we arrive at the following stability equations (for details see Chen F. 1990):

$$\left(D^2 - a^2 \right) \Theta_s = 0$$

(10)

$$\left(D^2 - a^2 \right)^2 W = Ra^2 \Theta$$

(11)

$$\left(D^2 - a^2 \right) \Theta = -W$$

(12)

$$\left(D_m{}^2 - a_m{}^2\right)W_m = -R_m a_m{}^2 \Theta_m \tag{13}$$

$$\left(D_m{}^2 - a_m{}^2\right)\Theta_m = -W_m \tag{14}$$

$$\left(D_m{}^2 - a_m{}^2\right)\Theta_s = 0 \tag{15}$$

where $D = \dfrac{d}{dz}, \; D_m = \dfrac{d}{dz_m}$,

$a = \sqrt{l^2 + m^2}, \; a_m = \sqrt{\tilde{l}^2 + \tilde{m}^2}$ are the overall horizontal wave numbers in fluid and porous layers respectively. $\nabla^2 = \partial^2/\partial x^2 + \partial^2/\partial y^2 + \partial^2/\partial z^2$, $\nabla_m^2 = \partial^2/\partial x_m{}^2 + \partial^2/\partial y_m{}^2 + \partial^2/\partial z_m{}^2$ are the Laplacian operators in fluid and porous layers respectively. The boundary conditions are:

$$\theta = \theta_s, \quad D\theta = k_r \, D\theta_s \qquad \text{at} \qquad z = 1 \tag{16}$$

$$\theta_m = \theta_s, \quad D\theta_m = k_{rm} \, D\theta_s \qquad \text{at}$$
$$z = -1 \tag{17}$$

$$D\theta_s = 0 \qquad \text{at}$$
$$z = -(1 + d_{rm}),\, 1 + d_r. \tag{18}$$

Here, $d_r = d_s/d$ is the ratio of the solid plate thickness to the liquid layer thickness and $d_{rm} = d_s/d_m$ is the ratio conductivity of the solid plate to that of the fluid layer with $k_{rm} = \zeta k_r$. Solving Eq. (15) for the solid layer, together with the boundary conditions $(16)-(18)$, the thermal boundary condition at the solid-fluid interface becomes

$$D\Theta = k_{rm} a_m \tanh\left(a_m d_{rm}\right)\Theta_m. \qquad \text{at } z = -1 \tag{19}$$

$$D\Theta = k_r a \tanh\left(a(2 + d_r)\right)\Theta. \qquad \text{at } z = 1 \tag{20}$$

$$D^2 W + M a^2 \Theta = 0 \qquad \text{at } z = 1 \tag{21}$$

$$W_m = 0 \qquad \text{at } z_m = -1 . \tag{22}$$

At the interface (i.e., z = 0) the continuity of velocity, temperature, heat flux, normal stress and the Beavers and Joseph 1967 slip conditions are imposed. Accordingly, the conditions are:

$$W = \frac{\zeta}{\varepsilon_T} W_m \tag{23}$$

$$\Theta = \frac{\varepsilon_T}{\zeta} \Theta_m \tag{24}$$

$$D\Theta = D_m \Theta_m \tag{25}$$

$$\left[D^2 - 3a^2\right]DW = \frac{-\zeta^4}{\varepsilon_T Da} D_m W_m \tag{26}$$

$$\left[D^2 - \frac{\beta \zeta}{\sqrt{Da}} D\right]W = \frac{-\beta \zeta^3}{\varepsilon_T \sqrt{Da}} D_m W_m \tag{27}$$

Where $\zeta = \dfrac{d}{d_m}$ the thickness of fluid layer to porous layer and β is the Beavers-Joseph slip parameter.

3. Long wavelength asymptotic analysis

The solution of the Eqs. (10) – (15) and boundary conditions Eqs. (16) – (18) is obtained using a regular perturbation technique with wave number a as a perturbation parameter. For studying the validity of the small wave number analysis, the variables W, W_m and Θ, Θ_m are expressed in terms of the small wave number a,

$$\left(W, \Theta\right) = \sum_{i=0}^{N} \left(a^2\right)^i \left(W_i, \Theta_i\right) \tag{28}$$

$$\left(W_m, \Theta_m\right) = \sum_{i=0}^{N} \left(\frac{a^2}{\zeta^2}\right)^i \left(W_{mi}, \Theta_{mi}\right) \tag{29}$$

Substitution of Eqs. (28) and (29) into Eqs. (11) – (14) and collecting the terms of zeroth order, we obtain

$$D^4 W_0 = 0 \tag{30}$$

$$D^2 \Theta_0 = -W_0 \tag{31}$$

$$D_m^2 W_{m0} = 0 \tag{32}$$

$$D_m^2 \Theta_{m0} = -W_{m0} \tag{33}$$

and the boundary conditions becomes

$$W_0 = 0, \quad D\Theta_0 = 0, \quad D^2 W_0 = 0 \qquad \text{at} \quad z = 1$$

(34)

$$W_{m0} = 0, \quad D_m \Theta_{m0} = 0, \quad D^2 W_{m0} = 0 \qquad \text{at} \quad z_m = -1.$$

(35)

And at the interface ($i.e\ z = 0$)

$$W_0 = \frac{\zeta}{\varepsilon_T} W_{m0}, \quad \Theta_0 = \frac{\varepsilon_T}{\zeta} \Theta_{m0}, \quad D\Theta_0 = D_m \Theta_{m0}$$

(36)

$$D^3 W_0 - \eta D^2 W_0 = \frac{-\zeta^4}{Da\xi\varepsilon_T} D_m W_{m0}$$

(37)

$$D^2 W_0 - \frac{\beta\zeta}{\sqrt{Da\xi}} DW_0 = \frac{-\beta\zeta^3}{\varepsilon_T \sqrt{Da\xi}} D_m W_{m0}.$$

(38)

The solution to the zeroth order Eqs. (30) - (33) is given by

$$W_0 = 0, \quad \Theta_0 = \frac{\zeta}{\varepsilon_T}, \quad W_{m0} = 0, \quad \Theta_{m0} = 1$$

(39)

At the first order in a^2 Eqs. (11) – (14) then reduces to

$$D^4 W_1 = R \frac{\varepsilon_T}{\zeta}$$

(40)

$$D^2 \Theta_1 - \frac{\varepsilon_T}{\zeta} = -W_1$$

(41)

$$D_m^2 W_{m1} = -R_m$$

(42)

$$D_m^2 \Theta_{m1} - 1 = W_{m1}$$

(43)

and the boundary conditions becomes

$$W_1 = 0, \quad D\Theta_1 = 2(1 + \zeta d_r)\zeta k_r \Theta_0, \quad D^2 W_1 = -M \frac{\varepsilon_T}{\zeta} \quad \text{at} \quad z = 1$$

(44)

$$W_{m1} = 0, \quad D_m \Theta_{m1} = k_{rm} d_{rm}, \qquad \text{at} \quad z_m = -1$$

(45)

And at the interface ($i.e\ z = 0$)

$$W_1 = \frac{1}{\varepsilon T \zeta} W_{m1}, \quad \Theta_1 = \frac{\varepsilon_T}{\zeta^3} \Theta_{m1}, \quad D\Theta_1 = \frac{1}{\zeta^2} D_m \Theta_{m1}$$

(46)

$$D^3 W_1 = \frac{-\zeta^2}{\sqrt{Da\varepsilon T}} D_m W_{m1}$$

(47)

$$D^2 W_1 - \frac{\alpha\zeta^2}{\sqrt{Da}} DW_1 = \frac{-\alpha\zeta}{\varepsilon T \sqrt{Da}} D_m W_{m1}$$

(48)

The general solutions of Eq. (40) – (42) respectively given by

$$W_1 = R\left[c_1 + c_2 z + c_3 \frac{z^2}{2} + c_4 \frac{z^3}{6} + \frac{z^4}{24} \right]$$

(49)

$$W_{m1} = R\left[c_5 + c_6 z - \frac{z^2}{2} \frac{Da\,\varepsilon T^2}{\zeta^4} \right]$$

(50)

$$c_1 = -\frac{-12Da^{3/2}R\alpha\,\varepsilon T - 24DaM\varepsilon T\zeta^2 - 12DaR\zeta^3 - 12Da^{3/2}R\,\varepsilon T\zeta^3 - 12\sqrt{Da}M\alpha\varepsilon T\zeta^4 - 5\sqrt{Da}R\alpha\zeta^5 - 4DaR\alpha\varepsilon T\zeta^5}{8R\zeta^5\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta^3 + \alpha\zeta^5\right)}$$

$$c_2 = -\frac{-12Da^{3/2}R\alpha\,\varepsilon T + 24DaM\varepsilon T\zeta^2 + 12DaR\zeta^3 + 12Da^{3/2}R\,\varepsilon T\zeta^3 - 12\sqrt{Da}M\alpha\varepsilon T\zeta^4 - 5\sqrt{Da}R\alpha\zeta^4 - 4\sqrt{Da}M\varepsilon T\zeta^7 - \sqrt{Da}R\zeta^8}{8R\zeta^5\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta^3 + \alpha\zeta^5\right)}$$

$$c_3 = \frac{-48\sqrt{Da}M\alpha\varepsilon T + 24\sqrt{Da}R\alpha\zeta + 12DaR\alpha\varepsilon T\zeta - 4M\varepsilon T\zeta^5 - R\alpha\zeta^6}{8R\zeta\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta^3 + \alpha\zeta^5\right)}$$

$$c_4 = -\frac{-12DaR\alpha\varepsilon T + 24\sqrt{Da}M\varepsilon T\zeta^2 + 12\sqrt{Da}R\zeta^3 + 12M\varepsilon T\zeta^4 + 5R\alpha\zeta^5}{8R\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta^3 + \alpha\zeta^5\right)}$$

$$c_5 = \frac{Da\varepsilon T^2}{2\zeta^4} - \frac{\sqrt{Da}\,\varepsilon T\left(12DaR\alpha\varepsilon T - 24\sqrt{Da}M\varepsilon T\zeta^2 - 12\sqrt{Da}R\zeta^3 - 12M\varepsilon T\zeta^4 - 5R\alpha\zeta^5\right)}{8R\zeta^4\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta + \alpha\zeta^3\right)}$$

$$c_6 = \frac{-\sqrt{Da}\varepsilon T\left(12DaR\alpha\varepsilon T - 24\sqrt{Da}M\varepsilon T\zeta^2 - 12\sqrt{Da}R\zeta^3 - 12M\alpha\varepsilon T\zeta^4 - 5R\alpha\zeta^5\right)}{8R\zeta^4\left(6\sqrt{Da}\alpha + 3\sqrt{Da}\zeta + \alpha\zeta^3\right)}$$

Equations (41) and (43) involving $D^2\Theta_1$ and $D_m^2 \Theta_{m1}$ respectively provide the solvability requirement which is given by

$$\int_0^1 W_1\,dz + \frac{1}{\zeta^2} \int_{-1}^0 W_{m1}\,dz = \frac{\varepsilon_T}{\zeta} + \frac{1}{\zeta^2} + \frac{kr\,dr}{\zeta^2}$$

(51)

The expressions W_1 and W_{m1} is back substituted in (51) and integrating , we obtain the expression for critical Rayleigh number R_c

$$R_c = \frac{1/\zeta^2 + kr\,dr/\zeta^2 + \varepsilon T/\zeta - M\alpha\varepsilon T\,\zeta^2\,c_7 - 3DaM\,\varepsilon T\,(\varepsilon T + \zeta)c_8 - \sqrt{Da}\,M\varepsilon T\,\Delta_1 c_9}{\alpha\,\zeta^3\,c_{10} + Da\Delta_2\,c_{11} + Da\Delta_3\,c_{12} + \sqrt{Da}\,\Delta_4\,c_9 + Da^{3/2}\,\varepsilon T\,\Delta_5\,c_{10}}$$

(52)

Where

$$c_7 = \frac{1}{48\left(\alpha\,\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)}$$

,

$$c_8 = \frac{1}{2\zeta^4\left(\alpha\,\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)}$$

,

$$\Delta_1 = 6\alpha\,\varepsilon T + 10\alpha\,\zeta + \zeta^2,$$

$$c_9 = \frac{1}{8\zeta^2\left(\alpha\,\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)}$$,

$$c_{10} = \frac{1}{320\left(\alpha\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)},$$

$$\Delta_2 = 4\varepsilon T\left(9 + 4\alpha\varepsilon T\right),$$

$$c_{11} = \frac{1}{48\zeta^3\left(\alpha\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)},$$

$$\Delta_3 = 3\left(12 + 5\alpha\varepsilon T\right)\zeta, \quad \Delta_4 = 25\alpha\varepsilon T + 39\alpha\zeta + 2\zeta^2,$$

$$c_{12} = \frac{1}{80\zeta\left(\alpha\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)},$$

$$\Delta_5 = 5\alpha\varepsilon T + 3\alpha\zeta + 4\varepsilon T\zeta + 3\zeta^2,$$

$$c_{13} = \frac{1}{4\zeta^6\left(\alpha\zeta^3 + 3\sqrt{Da}\left(2\alpha + \zeta\right)\right)}$$

IV. Results and Discussion

Rayleigh-Benard-Marangoni stability in a layer of composite scheme affected by walls of finite thickness and of finite conductivity were investigated by the linear analysis. The resulting eigen value problem is solved analytically using a regular perturbation technique with wave number a as a perturbation parameter. The marginal stability of the system considered in this investigation is given by equation (52). We can check this formula against known results for the following limiting case:

In the limit $M \to 0$ and $\zeta >>> 1$, equation (52) is simplified to the following result, which is the case of a single fluid layer between a solid walls of finite thickness and of finite conductivity,

$$R_c = 720\left(1 - \left(2 + d_r\right)k_r\right).$$
(53)

As $k_r = 0$ or $d_r = 0$, equation (53) can be reduced much further to the result $R_c \to 720$ which is the known exact value (Nield 1987).

To gain physical insight into the onset of the convection, we illustrate the eigen functions of vertical velocity W and corresponding streamline patterns in Figure 2. Figure 2 present the analytically predicted velocity profile at the vertical center line of a system for $\zeta = 1$ and various values of the k_r and d_r for $\alpha = 0.1, \zeta = 1, \varepsilon_T = 0.75, Da = 0.001$. It shows that

the major part of the flow is confined in the pure fluid layer $\left(0 \le z \le 1\right)$, while the fluid is almost at rest in the porous part. The variation of R_c obtained as a function of depth ratio ζ for different values of k_r, d_r are presented in a Fig.3. As expected, the effect of increase in k_r, d_r is to increase the critical Rayleigh number. Furthermore, the variation in has a significant effect on the onset of convection for the values of $\zeta \le 2.5$, while the curves of different k_r, d_r merge into one when $\zeta > 6$. The variation of M_c obtained as a function of depth ratio ζ for different values of k_r, d_r are presented in a Fig.4. As expected, the effect of increase in k_r, d_r is to increase the critical Rayleigh number. Furthermore, the variation is significant on the onset of convection for the values of $\zeta \le 2.5$, while the curves of different k_r, d_r merge in to one when $\zeta > 6$.

A plot of M_c as a function of R_m^c is shown in Fig.6 for a several values of kr, d_r for, $\varepsilon_T = 0.725$ $Da = 4 \times 10^{-6}$ and $\zeta = 1$. We notice from figure that when $M_c = 0$, the curve trend toward $R_m^c = 485$ for $k_r = d_r = 1$ the curve trend toward $R_m^c = 410$ for $M_c = 50$. This shows that the thermal buoyancy dominates the system over the effect of surface tension. It is evident from figure that the effect of thermal buoyancy increases so that the system is under the domination of the thermal mode.
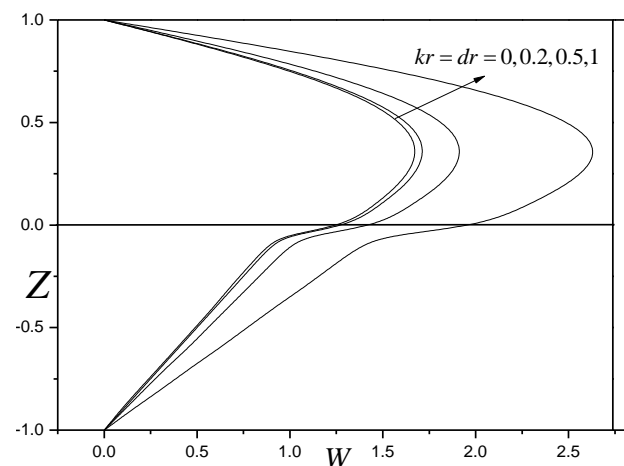
Fig.2. Vertical velocity profile for different values of kr, dr when $\zeta = 1$.
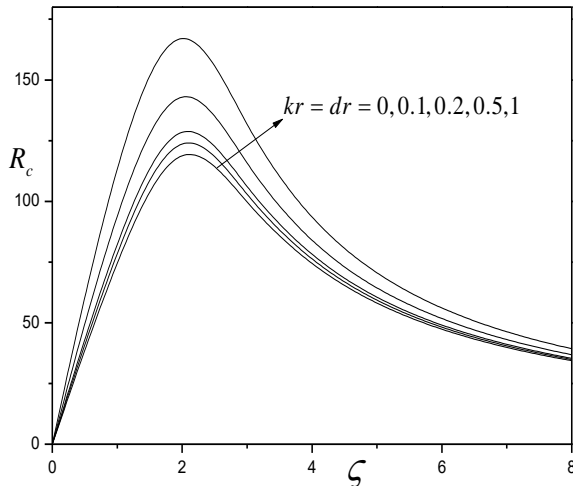
Fig.3. M_c versus ζ for different values of dr when $kr = 1$
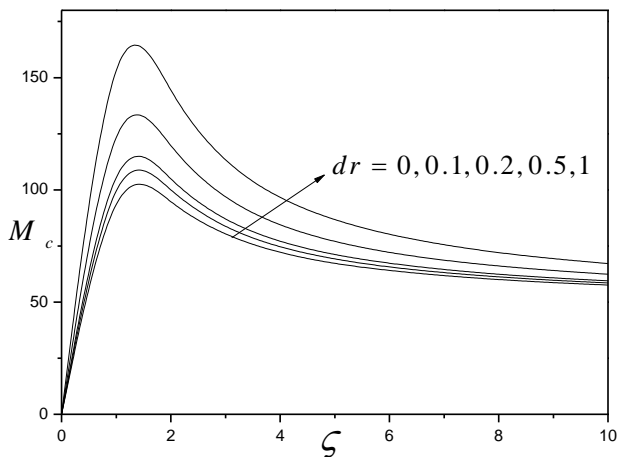
Fig.4. Variation of M_c with ζ for different values of dr.
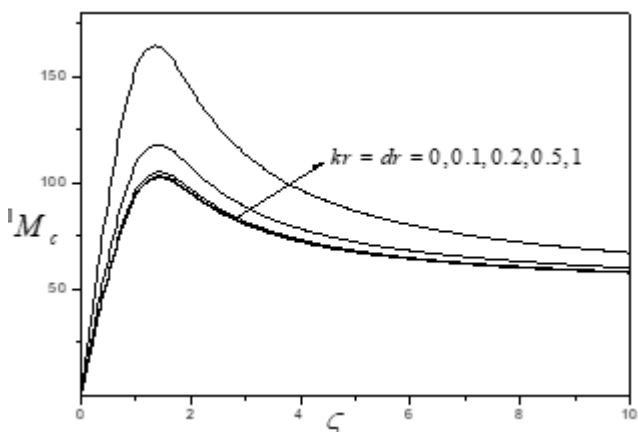
Fig.5. Variation of M_c with ζ for different values of kr, dr.
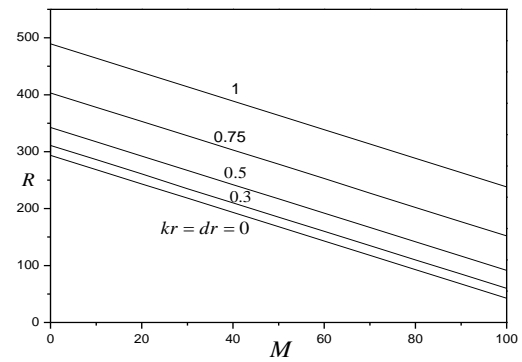
Fig.6. Variation of M with R for different values of kr, dr when $\zeta = 1$

V. CONCLUSION

Boundary effects on Rayleigh-Benard-Marangoni stability in a layer of composite scheme in which a liquid layer overlies a saturates porous material bounded by slabs of finite thermal conductivity and finite thickness has been investigated by means of linear stability analysis . From this we observed that it is possible to control the convection effectively by choosing various physical parameters .

In this investigation, an analytical study of Rayleigh-Bernard-Marangoni convection in a superposed fluid and porous layers with boundary slab. The simultaneous effect of the depth ratio, and the heat conductivity ratio and depth ratio (slab) were examined pictorially and compared to the constant viscosity model. The following main determinations are pointed out as follows throughout the above analysis.

· Stabilizes a larger depth ratio (slab) and the critical numbers of Marangoni and Rayleigh increases with .

· Increasing the heat conductivity ratio contributes to a stabilizing state as heat disturbances deep into the solid layer are easily dissipated and the critical numbers of Marangoni and Rayleigh rises.

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Characteristic Study of Combined effects of Dufour and Coriolis Force on Free Convection in a Rectangular Cavity with Isotropic and Anisotropic Porous Media

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ABSTRACT

This study investigates the effects of dufour and coriolis force on classic Rayleigh -Bènard problem for an laminar, viscous, unsteady incompressible fluid flow heated from below is extended to 3-dimesional convection in a finite geometry with isotropic and anisotropic porous media rotating with constant angular velocity. For the given physical set-up, g partial differential equations of the physical configuration are transformed to a set of non-dimensional ordinary differential equations using similarity transformation. This demands to apply Fourier series method to study the characteristic of velocity, temperature and concentration for the effect of Taylors number, Rayleigh number, Hartmann's number and Prandtl number for both anisotropic and isotropic porous media. The results of steam function and isotherms on various parameters have been discussed and found to be good agreement for the physical system.)

Keywords: Isotropic and anisotropic porous media, Free convection, Coriolis force, MHD.

I. INTRODUCTION

Among the different forms of energy, heat energy for its application in wide variety of fields has its own importance not only in industry but also in personal life. Humans are associated with the, utilization [1-3], generation [4], transformation [5] and convection [6] of heat energy management and conservation. In the last few decade research on thermally driven fluid flow and convection has considerably increased due to its applications diverse areas like, in meteorology, chemical food, metallurgical industries, nuclear reactor system, energy conservation and storage. Essential coupling between flow and thermal filed makes the buoyancy driven flows has not been investigated much. The problems in these flows are classified as free convection(external) and natural convection(internal) .

Gelfgat et al. [7] in 2001 studied of the effect of magnetic field on the an axisymmetric convective flow, convection in a vertical cylinder with a temperature variation on the sidewalls was considered. Galerkin method was applied to analysis the three dimensional stability of the flow.

Rayleigh–Be´nard convection exist when the horizontal wall is heated from below. This study has been done for various applications, particularly in

the field of electronics. Rayleigh–Be´nard convection is represented by non-linear partial differential equations for momentum, mass and energy whose resolution becomes ambiguous when the Rayleigh number exceeds a critical value. Many detailed investigations on Rayleigh–Be´nard convection, as well as reviews on this, like those of Yang [8] and Koschmieder [9].

The transformation from the conductive to the convective mode takes place at higher Rayleigh numbers than those for cavities with isothermal hot walls, and the flow in the central part of the cavity is more complex and non-permanent Fusegi et al. [10] and Janssen et al. [11].

Initially numerical studies of Natural convection flow were normally limited to two–dimensional configuration with comparatively low Rayleigh numbers (Ra). The fundamental ground of work was setup by de Vahl Davis et al [12] it gave original standard solutions for a square 2D cavity with 103 to 106 ; subsequently, Hortmann [13] came up with more accurate results by using the multi-grid method with a extremely finer mesh. Lot of others have duplicated the results with Ra up to 108 [14–17].

1.1 Nomenclature

a = width of the rectangular channel

β = Thermal expansion co-efficient

c = Specific hear at constant pressure

$\vec{g} = (0, 0, -g)$ acceleration due to gravity

h = Height of the rectangular channel

κ = Thermal diffusivity in isotropic case

$\kappa = (\kappa_x, \kappa_y, \kappa_z)$ Thermal diffusivity along x, y, z axis in anisotropic case

k = Permeability in isotropic case

$\vec{q} = (u, v, w)$ = Velocity of the fluid

R_a = Thermal Rayleigh Number

t = Time

T = Temperature

ΔT = Characteristic temperature difference

T_0 = Reference temperature

θ = Deviation from static temperature

ρ = Density

ρ_0 = Reference density

$(\rho c_v)_S , (\rho c_v)_f$ = Heat capacity per unit volume of the solid and fluid

x, y, z = Space coordinate

ν = Thermal viscosity

$\psi = \psi(x, y)$ = Streamline function

R_c = Solutal Rayleigh Number

$k = (k_x, k_y, k_z)$ Permeability along x,y,z axis in anisotropic case

p_1 = Pressure

$p = p_1 - \frac{1}{2}|\Omega \times r|$

S = Concentration

S_0 = Reference Concentration

ΔS = Characteristic Concentration difference

S = Deviation from the static concentration

σ = Growth rate

$T_a = \frac{2\Omega d^2}{\nu}$ = Taylors Number

$\xi = \frac{k_x}{k_z}\left(\frac{h}{a}\right)^2$ = Anisotropic ratio

$\eta = \frac{\kappa_x}{\kappa_z}\left(\frac{h}{a}\right)^2$ = Aspect ratio

$\Omega = (0, 0, \Omega)$ = Uniform angular velocity of the system

$\nabla = \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}\right) =$ Three dimensional gradient operator

$\nabla^2 = \left(\frac{\partial^2}{\partial x^2}, \frac{\partial^2}{\partial y^2}, \frac{\partial^2}{\partial z^2}\right) =$ Three dimensional Laplacian operator

Multiple attempts have been made on three-dimensional (3D) simulations, as the actual flow is always a 3D. the effects of a certain aspect of a ratio on flow patterns with Ra of order 106 was studied by Mallinson et al. [18]. Hysteretic behavior , observed by Labrosses et al. [19] using a pseudo-spectral solver. Trias et al. [20,21] investigated the 3D cavity of aspect ratio 4 with periodic lateral walls and showed that there is significant difference in the flow dynamics between two- dimension and three-dimension results. It is emphasized that natural convection flow in a three dimensional cubical cavity with adiabatic lateral walls has been comparatively explored less [22-24].

There is no work carried out by to understand the effect of concentration on the temperature. This effect can be understood with the dufour term which is introduced in the temperature equation. Here the main objective of the study is to understand the effect of dufour and coriolis force on classic Rayleigh -Bènard problem for an laminar, viscous, unsteady incompressible fluid flow heated from below is extended to 3-dimesional convection in a finite geometry with isotropic and anisotropic porous media rotating with constant angular velocity.

II. MATHEMATICAL FORMULATION

A 3-D free convection in a rectangular porous box, non-uniformly heated from down is considered. The porous media is considered to be saturated and an-isotropic by a incompressible homogeneous fluid. The rectangular box is of width a and height h, we choose vertical direction of the box as z axis, the

horizontal walls of the box are at z=(0,h) and the horizontal direction along the length of the box as x axis, vertical walls are at x = ± a/2, Fig. (1). In order to neglect the inertia terms and appeal to Boussinesq approximation Prandtl-Darcy number is assumed to be very large. The 3-D model of the Darcy-Boussinesq equations takes the formKeep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial z} = 0 \quad , \tag{2.1}$$

$$\frac{1}{\rho_0} \frac{\partial p}{\partial x} + \frac{\nu}{k_x} u - 2\Omega v = 0, \tag{2.2}$$

$$\frac{1}{\rho_0} \frac{\partial p}{\partial y} + \frac{\upsilon}{k_y} v + 2\Omega u = 0, \tag{2.3}$$

$$\frac{1}{\rho_0} \frac{\partial p}{\partial z} - \frac{\rho}{\rho_0} g + \frac{\upsilon}{k_z} w = 0 \quad , \tag{2.4}$$

$$c\frac{\partial T}{\partial t} + v.\nabla T = \kappa_x \left(\frac{\partial^2 T}{\partial x^2} + \frac{\sigma_x}{c_s} \frac{\partial^2 S}{\partial x^2} \right) + \kappa_z \left(\frac{\partial^2 T}{\partial z^2} + \frac{\sigma_z}{c_s} \frac{\partial^2 S}{\partial z^2} \right) \tag{2.5}$$

$$\frac{\partial S}{\partial t} + u \frac{\partial S}{\partial x} + w \frac{\partial S}{\partial z} = \sigma_x \frac{\partial^2 S}{\partial x^2} + \sigma_z \frac{\partial^2 S}{\partial z^2} \quad , \tag{2.6}$$

$$\rho = \rho_0 \left[1 - \beta(T - T_0) + \alpha(S - S_0) \right]. \tag{2.7}$$
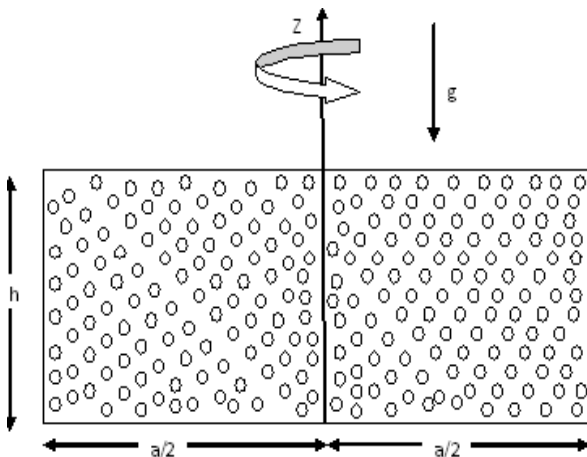
Fig. 1. Physical Configuration.

The lower and the upper walls of the box are at isothermal temperatures T0 andT0+ΔT here ΔT is the absolute temperature. All the walls of the box are considered to heat conducting and impermeable. From the equations (2.1) to (2.7) we get that a static conduction occurs if the constant temperature circulation depends linearly on z and is sovereign of x.

$$T = \left[T_0 + \Delta T \left(1 - \frac{z}{h} \right) \right] + \theta,$$

$$S = \left[S_0 + \Delta S \left(1 - \frac{z}{h} \right) \right] + s \tag{2.8}$$

Where θ and s are the deviations from the static temperature and concentration respectively.

Because the flow is axis symmetric, we represent the stream function $\psi = \psi(x, y)$ by

$$u = \frac{\partial \psi}{\partial z}, \qquad w = -\frac{\partial \psi}{\partial x} \quad . \tag{2.9}$$

Non-dimensional terms are represented by asterisks

$$u = \frac{\kappa_x a u^*}{h^2}, v = \frac{\kappa_y a v^*}{h^2}, w = \frac{\kappa_z w^*}{h}, t = \frac{ch^2 t^*}{\kappa_z};$$

$$x = ax^*, y = ay^*, z = hz^*,$$

$$\psi = \frac{\kappa_z a \psi^*}{h}, \theta = \Delta T \theta^*, T_0 = \Delta T T_0^*, p = \frac{vk_z \rho_0 p^*}{k_z}, S = \Delta S S^* \tag{2.10}$$

On introduction of above expressions into equations (2.1)-(2.7), the governing equation takes the form:

$$\left(\xi \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial z^2} \right) \psi + \xi R_a \frac{\partial \theta}{\partial x} - \xi R_S \frac{\partial s}{\partial x} - T_a \frac{\partial v}{\partial z} = 0 \tag{2.11}$$

$$\chi \frac{\partial v}{\partial z} + T_a \frac{\partial^2 \psi}{\partial z^2} = 0 \quad , \tag{2.12}$$

$$P_c \left(\zeta \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial z^2} \right) S - \frac{\partial \psi}{\partial t} = \frac{\partial S}{\partial t} , \tag{2.13}$$

$$\left(\eta \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial z^2} \right) \theta + p_m \left(\zeta_1 \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial z^2} \right) S - \frac{\partial \psi}{\partial x} = \frac{\partial \theta}{\partial t} . \tag{2.14}$$

Where, Rs is the Solutal Rayleigh number (or Darcy- Solutal Rayleigh number) and Ra is the Rayleigh number (or Darcy- Rayleigh number,is given by

$$R_S = \frac{\alpha g \Delta S k_z h}{\kappa_z \upsilon}, \ p_m = \frac{\Delta S}{\Delta T}\left(\frac{\sigma_z}{C_s}\right), \ R_a = \frac{\beta g \Delta T k_z h}{\kappa_z \upsilon}.$$

(2.15)

The anisotropy aspect ratio of permeability and diffusivity of temperature are represented by ξ, η, ζ and χ

$$\xi = \frac{k_x}{k_z}\left(\frac{h}{a}\right)^2, \eta = \frac{\sigma_x}{\sigma_z}\frac{\kappa_x}{\kappa_z}\left(\frac{h}{a}\right)^2, \zeta = \frac{\sigma_x}{\sigma_z}\left(\frac{h}{a}\right)^2,$$

$$\zeta_1 = \frac{k_x}{k_z}\frac{\sigma_x}{\sigma_z}\left(\frac{h}{a}\right)^2, \ \chi = \frac{k_x}{k_z}\left(\frac{a}{h}\right)^2. \quad (2.16)$$

The boundary condition for absolutely impermeable boundaries and heat conducting walls is given by

$$S = \psi = \theta = \frac{\partial v}{\partial z} = 0 \text{ on } \begin{cases} x = -\frac{1}{2}, x = \frac{1}{2} & 0 < z < 1 \\ \\ z = 0, \ z = 1 & -\frac{1}{2} < x < \frac{1}{2} \end{cases}.$$

(2.17)

III. STEADY FLOW PATTERNS AND LINEAR STABILITY

Free convection, mentioned by linear versions of the equation (2.11) to (2.14). The solution of these equations can be expended in Fourier series as

$$\psi = e^{\sigma t}\left[\frac{C_0}{2} + \sum_{n=1}^{\infty} C_n(x)\cos n\pi z + D_n(x)\sin n\pi z\right],$$

(3.1)

$$\theta = e^{\sigma t}\left[\frac{F_0}{2} + \sum_{n=1}^{\infty} F_n(x)\cos n\pi z + G_n(x)\sin n\pi z\right],$$

(3.2)

$$v = e^{\sigma t}\left[\frac{A_0}{2} + \sum_{n=1}^{\infty} A_n(x)\cos n\pi z + B_n(x)\sin n\pi z\right],$$

(3.3)

$$S = e^{\sigma t}\left[\frac{S_0}{2} + \sum_{n=1}^{\infty} S_n(x)\cos n\pi z + H_n(x)\sin n\pi z\right].$$

(3.4)

Where $C_n, D_n, F_n, G_n, A_n, B_n, S_n$ and H_n are in terms of x only and the growth rate is represented σ. To satisfy the boundary conditions (2.17) we need to consider $C_n = F_n = S_n = B_n = 0$ for all x.

On substituting the equation (3.1) - (3.4) to the linearized governing equations, we get differential equations:

$$\left(\xi \frac{d^2}{dx^2} - n^2\pi^2\right)D_n + \xi R_a \frac{dG_n}{dx} - \xi R_S \frac{dH_n}{dx} + T_a n\pi A_n = 0$$

, (3.5)

$$\chi A_n + T_a n\pi D_n = 0, \quad (3.6)$$

$$P_c\left(\zeta \frac{d^2}{dx^2} - n^2\pi^2\right)H_n - \frac{dD_n}{dx} = \sigma H_n,$$

(3.7)

$$\left(\eta \frac{d^2}{dx^2} - n^2\pi^2\right)G_n + p_m\left(\zeta_1 \frac{d^2}{dx^2} - n^2\pi^2\right)H_n - \frac{dD_n}{dx} = \sigma G_n$$

. (3.8)

And the boundary conditions for D_n, G_n, A_n and H_n as below

$$D_n\left(\frac{1}{2}\right) = D_n\left(-\frac{1}{2}\right) = 0, \qquad A_n\left(\frac{1}{2}\right) = A_n\left(-\frac{1}{2}\right) = 0,$$

$$G_n\left(\frac{1}{2}\right) = G_n\left(-\frac{1}{2}\right) = 0, \qquad H_n\left(\frac{1}{2}\right) = H_n\left(-\frac{1}{2}\right) = 0.$$

(3.9)

We can conclude from equation (2.11) - (2.14) and from boundary condition (2.17) that σ to be real.

Thus, to find critical Rayleigh number Ra_c which is a function of (ξ, η, ζ, χ), for the marginal

stability we can substitute $\sigma = 0$ in the equations (3.7) and (3.8). The set of equations (3.5) to (3.8) together with the bc's (3.9) gives Ra as the eigen value, Ra_c is the smallest eigen value. The general solution is of the form

$$D_n(x, R_a) = \left[C_1 \cos px + C_2 \sin px + C_3 \cos qx + C_4 \sin qx \right], \quad (3.10)$$

$$G_n(x, R_a) = t \left[r \left(C_1 \sin px - C_2 \cos px \right) + C_3 \sin qx - C_4 \cos qx \right], \quad (3.11)$$

$$H_n(x, R_a) = s \left[r \left(C_1 \sin px - C_2 \cos px \right) + C_3 \sin qx - C_4 \cos qx \right], \quad (3.12)$$

$$A_n = \frac{-n\pi T_a}{\xi} \left[C_1 \cos px + C_2 \sin px + C_3 \cos qx + C_4 \sin qx \right]. \quad (3.13)$$

Where, C_1, C_2, C_3 and C_4 are arbitrary constants and

$$p q = \frac{1}{2\sqrt{\xi}} \left\{ \left[\sqrt{R_a \left(\frac{p_m}{P_c} - 1 \right) + n^2\pi^2 \left(2 + \frac{T_a^2}{\xi} \right) - \frac{R_s}{P_c} + 2n^2\pi^2 \sqrt{1 + \frac{T_a^2}{\xi}}} \right] \right.$$
$$\left. \pm \left[\sqrt{R_a \left(\frac{p_m}{P_c} - 1 \right) + n^2\pi^2 \left(2 + \frac{T_a^2}{\xi} \right) - \frac{R_s}{P_c} - 2n^2\pi^2 \sqrt{1 + \frac{T_a^2}{\xi}}} \right] \right\}$$

(3.14)

$$r = \frac{q \left(\xi p^2 + n^2\pi^2 \left(1 + \frac{T_a^2}{\xi} \right) \right)}{p \left(\xi q^2 + n^2\pi^2 \left(1 + \frac{T_a^2}{\xi} \right) \right)},$$

$$s = \frac{\xi q^2 + n^2\pi^2 \left(1 + \frac{T_a^2}{\xi} \right)}{q \xi \left(R_a P_c \left(1 - \frac{p_m}{P_c} \right) \right)},$$

$$t = (P_c - pm) \frac{\xi q^2 + n^2\pi^2 \left(1 + \frac{T_a^2}{\xi} \right)}{\xi q \left(R_a P_c \left(1 - \frac{p_m}{P_c} \right) - R_s \right)}.$$

(3.15)

Here, $p \neq q$ is assured by the boundary conditions at $Ra \neq Ra_c$ .from (3.9) boundary condition we get the non-trivial solution of the given problem when

I. $(1-r)\sin\left(\dfrac{p+q}{2}\right) - (1+r)\sin\left(\dfrac{p-q}{2}\right) = 0$ and

$\qquad C_2 = C_4 = 0 \qquad\qquad\qquad (3.16)$

II. $(1-r)\sin\left(\dfrac{p+q}{2}\right) + (1+r)\sin\left(\dfrac{p-q}{2}\right) = 0$ and

$\qquad C_2 = C_4 = 0. \qquad\qquad\qquad (3.17)$

In the case of isotropic medium where $\xi = \eta = \zeta = \chi$, Ra_c can be calculated by solving the equations analytically. Where else in case of anisotropic medium where $\xi \neq \eta = \zeta \neq \chi$, Ra_c found numerically.

The isotropic porous media case: In this case the condition $\xi = \eta = \zeta = \chi$ is fullfilled if $\dfrac{\kappa_x}{\kappa_z} = \dfrac{k_x}{k_z}$, i.e. the proportion of the parallel and perpendicular component of thermal diffusivity and the permeability are equal.

The following condition for case I and II are obtained at $r = 1$

$$p - q = 2m\pi, \text{ for } m = 1, 2, 3, 4\ldots\ldots$$

(3.18)

It gives

$$R_a = \frac{P_c}{P_m - P_c} \left(4\pi^2\xi m^2 + \frac{R_s}{P_c} - n^2\pi^2 \left(2 + \frac{T_a^2}{\xi} \right) + 2n^2\pi^2 \sqrt{1 + \frac{T_a^2}{\xi}} \right). \quad (3.19)$$

Where $n = 1, 2, 3, 4\ldots\ldots$ and $m = 1, 2, 3, 4\ldots\ldots$

Critical RayEquation (3.19) the critical Rayleigh number, which is the smallest possible value of R_a

$$Ra_c = \frac{P_c}{P_m - P_c} \left(4\pi^2\xi + \frac{R_s}{P_c} - \pi^2 \left(2 + \frac{T_a^2}{\xi} \right) + 2\pi^2 \sqrt{1 + \frac{T_a^2}{\xi}} \right). \quad (3.20)$$

For an isotropic medium, the smallest eigen value corresponds to $n = 1$ and $m = 1$

$$Ra_c = \frac{P_c}{pm - P_c} \left(\begin{array}{l} 4\pi^2 \left(\frac{h}{a}\right)^2 + \frac{R_s}{P_c} - \pi^2\left(2 + T_a^2\left(\frac{a}{h}\right)^2\right) \\ + 2\pi^2\sqrt{1 + T_a^2\left(\frac{a}{h}\right)^2} \end{array} \right).$$

(3.21)

As the limit $\left(\frac{h}{a}\right) \to 0$ and $T_a \to 0$ the channel tends to infinitesimal horizontal porous layer. In such case critical Rayleigh number $Ra_c = 4\pi^2$ it is in line with a well-known conclusion for the permeable layers [25]. The critical value from the equation (3.21) is not same as the conclusion found for a channel with absolutely insulating walls done by [26]. In case $h = a$, i.e we get a square box, equation (3.21) gives $Ra_c = 8\pi^2$ whereas the result corresponding to perfectly insulating lateral walls gives $Ra_c = 4\pi^2$. Since, in this case the heat transfer over the walls. A greater critical value is expected with conducting lateral wall box.

The flow at the onset of neutral convection is the flow for moderately super Critical Rayleigh number. Since the equations (3.16) and (3.17) coincides when $\xi = \eta = \zeta = \chi$, i.e. when $r = 1$, the boundary value problem gives two linearly independent solutions. It can also seen from (2.11) and (2.14) equations.

Let ψ_0, θ_0, S_0 and v_0 are the solutions at $Ra = Ra_c$, then $\psi_1 = -\xi R_a \theta_0$, $\theta_1 = \psi_0$ and $v_1 = v_0$ are linearly independent solutions.

The two set of solutions are given by

$\psi^{(1)} = Q\cos Kx \sin \pi x \sin \pi z$;

$\theta^{(1)} = Q s \sin Kx \sin \pi x \sin \pi z$;

$v^{(1)} = \frac{-n\pi T_a}{\xi} Q\cos Kx \sin \pi x \cos \pi z$;

$s^{(1)} = -Q \sin Kx \sin \pi x \sin \pi z$,

$\psi^{(2)} = \frac{S}{s} \cos Kx \sin \pi x \sin \pi z$;

$\theta^{(2)} = S \sin Kx \cos \pi x \sin \pi z$, (3.22)

$v^{(2)} = -\frac{St}{s} \sin Kx \cos \pi x \cos \pi z$;

$s^{(2)} = -\frac{\pi S T_a}{s\xi} \cos Kx \cos \pi x \sin \pi z$ (3.23)

Where, amplitude constants are Q and S. A symmetric flow pattern having 2n cells is given by equation (3.22), where the number of cells n depends on ξ. A symmetric flow arrangement having of $2n \pm 1$ cells is given by (3.23).

Table 1. Values for Ra_c for different values of ξ and η. The principle diagonal coincide with the isotropic case.

ξ/η	0.125	0.25	0.5	1	2
0.125	51463	26181	13419	6954	3662
0.25	101699	51473	26190	13429	6964
0.5	201691	101719	51493	26210	13449
1	400998	201731	101758	51532	26250
2	798652	401077	201810	101837	51611

(i) The Anisotropic case:

This case deals with the condition $\xi \neq \eta = \zeta \neq \chi$ the non - trivial solutions for D_n, A_n, H_n and G_n when the equations (3.16) and (3.17) are fulfilled. Case I gives the solution in the form of

i). $D_n(x) = \left[\sin px - \frac{\sin\frac{p}{2}}{\sin\frac{q}{2}} \sin qx \right]$,

$G_n(x) = -s\left[r\cos px - \frac{\sin\frac{p}{2}}{\sin\frac{q}{2}} \cos qx \right]$,

$H_n(x) = -t\left[r\cos px - \frac{\sin\frac{p}{2}}{\sin\frac{q}{2}} \cos qx \right]$,

$A_n(x) = \frac{-n\pi T_a}{\chi}\left[\sin px - \frac{\sin\frac{p}{2}}{\sin\frac{q}{2}} \sin qx \right]$,

and for case ii).

$$D_n(x) = \left[\cos px - \frac{\cos \frac{p}{2}}{\cos \frac{q}{2}} \cos qx \right],$$

$$G_n(x) = -s \left[r \sin px - \frac{\cos \frac{p}{2}}{\cos \frac{q}{2}} \sin qx \right],$$

$$H_n(x) = t \left[r \sin px - \frac{\cos \frac{p}{2}}{\cos \frac{q}{2}} \sin qx \right],$$

$$A_n = \frac{-n\pi T_a}{\chi} \left[\cos px - \frac{\cos \frac{p}{2}}{\cos \frac{q}{2}} \cos qx \right].$$

Solutions (i) and (ii) are defined for an large numbers of eigen values. Let two smallest eigen values in each of the above case Ra_1 and Ra_2. These values will exist at $n = 1$. Form equation (3.16) and (3.17) Ra_1 and Ra_2 are calculated for a given value of ξ, η, ζ and χ. Critical Rayleigh number $Ra_c = \{Ra_1 \text{ and } Ra_2\}$. Normally Ra_1 and Ra_2 are not equal, it means there exist an exclusive values for $Ra_1 \text{ and } Ra_2$ i.e. at the convection there exist a different laminar flow pattern.

IV. SUMMARY

In this study, the effect of uneven temperature gradient on the free convection in a horizontal rectangular box in three dimensions is investigated. The three dimensional problem is transformed to a two dimensional double diffusive convection problem, in which diffusing components are temperature and solute in a anisotropic and isotropic rectangular channels. Channel is considered to heat conducting and impermeable. The channel is heated non- uniformly from below and added solutes to build a linear concentration and temperature distributions in the perpendicular directions. Apart from Boussinesq approximation, which states density remains constant throughout the momentum equation except for the body force and also the following assumptions have been considered.

- Large heating at the walls implies the non-dimensional parameters Darcy-Prandtl numbers are large and hence the inertial and viscous terms are neglected in the momentum equation.
- Flow is symmetric with respect to Y-axis and thereby, introduced the stream function which enables to determine the critical Rayleigh number and solutal Rayleigh number based on the linear stability theory.

The critical Rayleigh number Ra_c obtained by solving the resulting eigen value problem for $(\xi \neq \eta = \zeta \neq \chi)$ in the anisotropy case, whose eigen value is found to be

$$Ra_c = \frac{1}{1-p_m} \left\{ \pi^2 \left[4\eta + \left(1 + \sqrt{\frac{\eta}{\xi} \left(1 + \frac{T_a^2}{\chi} \right)} \right)^2 \right] + R_s \right\}.$$

The critical Rayleigh number for the corresponding isotropic case $(\xi = \eta = \zeta = \chi)$ as a particular case of the above equation whose eigen value is found to be

$$Ra_c = \frac{P_c}{p_m - 1} \left(4\pi^2 \xi + R_s - \pi^2 \left(2 + \frac{T_a^2}{\xi} \right) + 2\pi^2 \sqrt{1 + \frac{T_a^2}{\xi}} \right)$$

The result is in accordance with the previous result, when $T_a = 0$ it reduces to Rayleigh number found in the non-rotating case , when $T_a = 0$ and $\xi = \eta = \zeta = \chi$ (in the isotropic case), as the limit $\frac{h}{a} \to 0$ it reduces to the standard results $Ra_c = R_S + 4\pi^2$ and $Ra_c = 4\pi^2$ when $R_s = 0$ in the absence of the second diffusing components which is in line with the acclaimed result for the porous layers [25]. Two sets of solution which are linearly independent are derived, presents a different nice steady flow patterns at moderately super critical Rayleigh number.

Fig. (8) Represents the plotted graph of critical Rayleigh number versus ratio of permeability to thermal diffusivity. The observation shows that the critical Rayleigh number Rac varies inversely with ratio ξ / η. The critical Rayleigh number are further increases with increasing Taylors number, Solutal Rayleigh number and the effects of rotation therefore, is to destabilize the system more significantly. Observation from Steady flow Patterns.

V. CONCLUSION

Using the similarity transformation we transferred the partial differential equation to ordinary differential equation and Fourier series analysis has been applied to obtained the solution of ordinary differential equations to know the critical Rayleigh numbers, stream function and isotherms of the physical domain to understand the effect of dufour and coriolis force on classic Rayleigh -Bènard problem for an laminar, viscous, unsteady incompressible fluid flow heated from below is extended to 3-dimesional convection in a finite geometry with isotropic and anisotropic porous media rotating with constant angular velocity

The following observations have been main in flow pattern of the streamlines and isothermal lines.

· The number of cells found to be increased with the increase in the Taylor's number for both isotropic and anisotropic cases. Fig. (2) and (4). Increase in Taylor's number increases the coriolis force, which intern increases the number of rotation. Increase in rotation increases the streamlines and isothermal lines.

· The isothermal lines show the increase in the oscillatory flow behaviour with rotation in anisotropic case. Fig. (7)

· The number of cell found to be decreased with increase in aspect ratio and thermal diffusivity in the anisotropic case. Fig. (5) and (6)

· The isotherm becomes more and more flattened with the anisotropy.
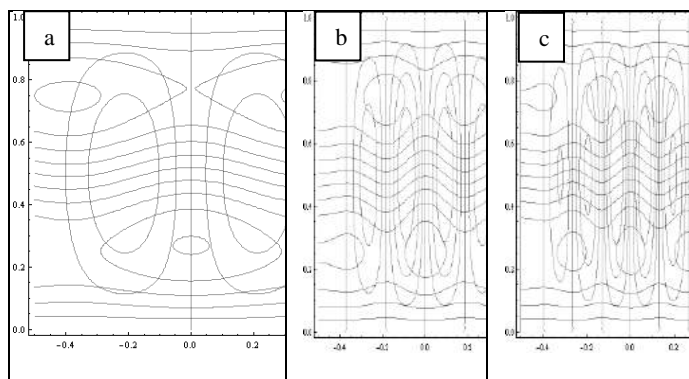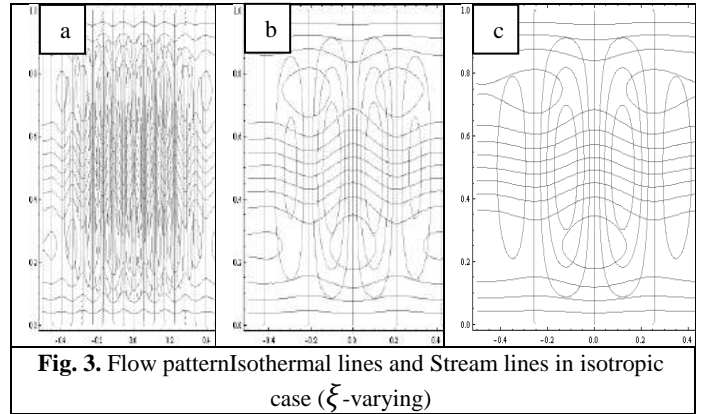
Fig. 3. Flow patternIsothermal lines and Stream lines in isotropic case (ξ-varying)
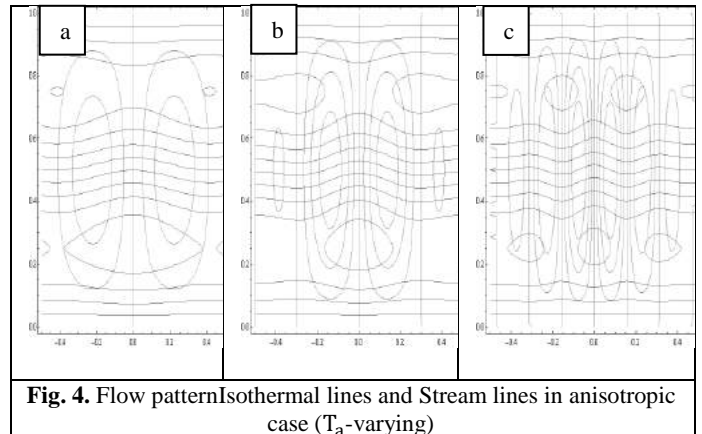
Fig. 4. Flow patternIsothermal lines and Stream lines in anisotropic case (T_a-varying)
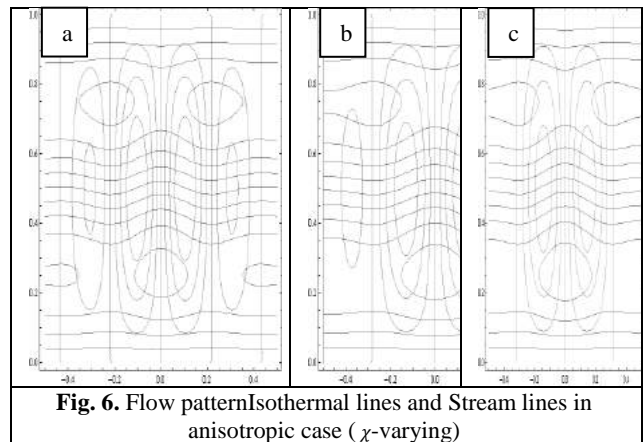
Fig. 6. Flow patternIsothermal lines and Stream lines in anisotropic case (χ-varying)
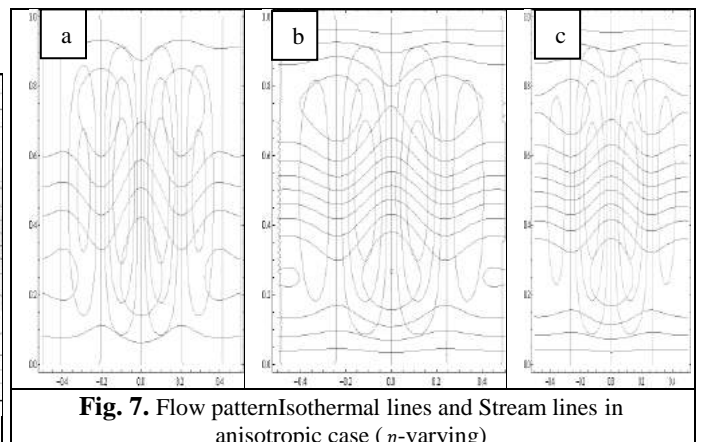
Fig. 7. Flow patternIsothermal lines and Stream lines in anisotropic case (η-varying)
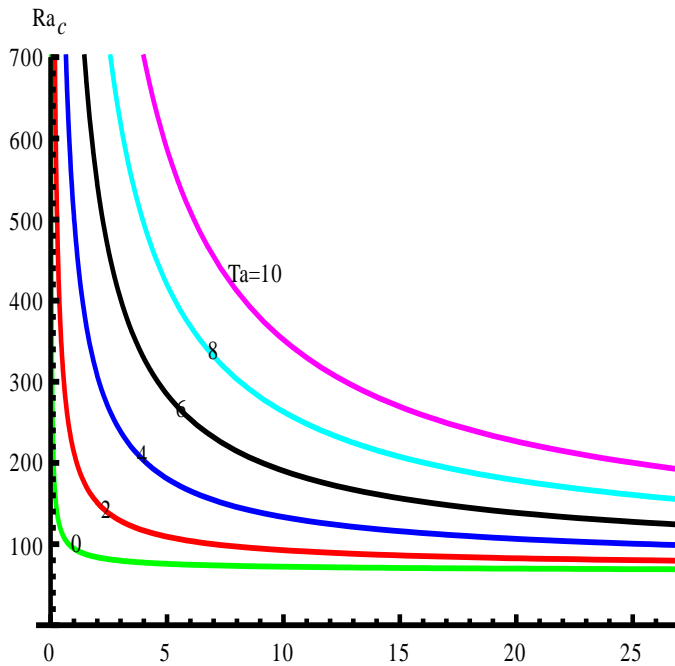
Fig. 2. Flow patternIsothermal lines and Stream lines in isotropic case (T_a-varying)

Fig. 8. Plot Ra_c vs ξ/η (Rs=50, ξ=0.5, η=0.125)

Acknowledge

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Fuzzy Sets and Graphs

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ABSTRACT

Fuzzy sets in mathematics correspond to uncertainty. We have defined fuzzy graph and its adjacency matrix and discussed about the bounds and energy of Fuzzy graphs. We have also extended the concept to social network to study strength of relationship.

Keywords: Adjacency matrix, Bounds, connected graph, Energy, vertex, edges, walk, path, strength, Fuzzy sets, Fuzzy graph.

I. INTRODUCTION

In real world problems, Mathematical model are stable till reasons, computing are crisp and precise in character, but when the complexity of a system increases behavior of system may not be very crisp and precise. Complexity, credibility and uncertainty are the major pillar of any model. Uncertainty has a pivotal role in maximizing the usefulness of a system.

Lotfi A. Zadeh gave framework to describe this phenomenon of uncertainty in his paper "Fuzzy Sets". Fuzzy principle is "Everything is a matter of degree" and the logic is called Fuzzy logic. Fuzzy subset of set P is a map called membership function .Value assigned to a individual represents its grade of membership in fuzzy sets.

Fuzzy set $P^{\sim}$ define as a set of ordered pairs. Mathematically it is represented as –

$$P^{\sim} = \{y, \mu P^{\sim}(y) \text{ such that } y \in U \}$$

Where U is the universal set and $\mu P^{\sim}(y)$ = degree of membership of y in {P} and the values of this set is in the range from 0 to 1.[1]

Graph is a presentation of number of points that are linked by lines. It is a study of points and lines. Each point is called a vertex and the lines are called edges.

Graph is a tool for modeling relationships. They are used to find solutions to various problems. Graphical models are used to represent traffic network, communication network, airlines network, railway network, social networks etc. Many times graph can not represent all the systems properly, because of some uncertainty of the parameters of system, that is the reason why Fuzzy graph is been discussed. [2]

II. LOGICS OF FUZZY GRAPH

Fuzzy graph called f-graph is a combination of G: (σ, μ) here σ as fuzzy subset of P and μ as fuzzy relation on σ. Here P is nonempty finite set. Here μ is a relation named reflexive and symmetric on σ. Where $\sigma : P \rightarrow [0,1]$ and

$\mu : \times P \rightarrow [0,1] : \mu(u,v) \leq \sigma\{u\} \wedge \sigma\{v\} \forall$ u and v are the elements of set P. The crisp graph of the Fuzzy graph G: (σ, μ) is expressed as G*: (σ^*, μ^*) where σ^* is non empty set P of nodes and $\mu^* = E$ subset of $P \times P$. [3][4]

Fuzzy graph T : (τ, ω) said as partial fuzzy sub graph of G: (σ, μ) if $\tau(u) \leq \sigma(u) \forall$ u and $\omega(u,v) \leq \mu(u,v) \forall$ u, v. Also we can say T : (τ, ω) a fuzzy sub graph of G: (σ, μ) if $\tau(u) = \sigma(u)$ for all u $\epsilon \tau^*$ and

$\omega(u,v) = \mu(u,v) \; \forall \quad u, v \; \epsilon \; P^*$ [5]

Further we will discuss about order and size of Fuzzy graph with degree of its vertices.

For fuzzy graph G: (σ, μ): order of G is defined as $\sum \sigma(x)$ where x belongs to underlying set P. It is denoted by O (G). Fuzzy graph G: (σ, μ) : size of G is defined as $\sum \mu(x,y)$ where x , y belongs to underlying set P. It is denoted by S (G). For a fuzzy graph G: (σ, μ) : degree of a vertex u is define as $d_G(u) = \sum \mu(u,v)$. [6]

Let us consider Fuzzy graph G: (σ, μ) with a = 0.4, b = 0.5, c = 0.6, d = 0.2 and edges ab = 0.7, ad = 0.2, cd = 0.6, ac = 0.3
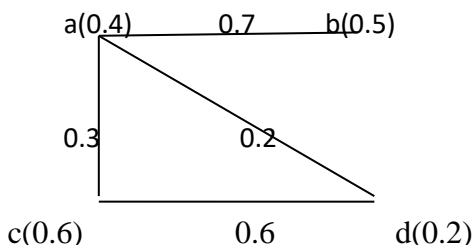
Here O (G) =1.8   S (G) = 1.7 $d_G(a) = 1.2$, $d_G(b) = 0.7, d_G(c) = 0.9, d_G(d) = 0.8$

III.   ENERGY AND BOUNDS OF A GRAPH

Graph Energy : It is the sum of absolute values of Eigen values in adjacency matrix of any graph . Graph G with vertices and edges as {n,m}, say $v_1, v_2 \ldots, v_n$ be the vertices. Adjacency matrix A = A (G) of any graph G is the square matrix with order n such as--

$a_{ij} = \begin{cases} 1 & \text{if } i \neq j : \; v_i \text{ and } v_j \text{ are adjacent} \\ 0 & \text{if } i \neq j : v_i \, , v_j \text{ are not adjacent} \\ 0 & \text{if } i = j \end{cases}$

If λ1, λ2, . . . ,λn are the Eigen values for A(G). Then Graph energy for G is

$E = E (G) = \sum_{i=1}^{n} |\lambda i|$

In view of the fact that A is symmetric matrix having zero trace, sum of Eigen values is equal to zero and all Eigen values are real. [7][8][9]

λ1 ≥ λ2 ≥ · · · ≥ λn,

λ1 + λ2 + · · · + λn = 0

EXAMPLE: Let G be a disconnected graph
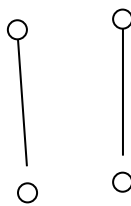
Then A (G) = $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

Characteristic polynomial is det (xI$_4$ -A) = (x^2-1)(x^2-1) with Eigen values 1,-1,1,-1

Energy of the graph E (G) = 4

If G$_1$ and G$_2$ are two components of above disconnected graph then we can easily verify that

E (G) = E (G$_1$) + E (G$_2$)

BOUNDS:

The bounds of graph are defined on the basis of vertices, edges, and determinants of adjacency matrix etc. Upper bound and lower bounds are explored, which define graphs with both extreme energies and is considered as field of upcoming growing area for research under spectral graph theory. [10][11][12]

Lower bounds on the energy of a graph are-

1.On the basis of Edges — (With equality holding iff G contains complete bipartite graph Ka, b : a · b = m, arbitrarily a lot of isolated vertices. $E\,(G) \geq 2\sqrt{m}$

2. On the basis of vertices and edges and the determinant---

$$E\,(G) \geq \frac{E\,(G)}{\sqrt{2m + n(n-1)|\det A|^{2/n}}}$$

3. As per non singular graphs

$$E\,(G) \geq \frac{2m}{n} + n - 1 + \ln\left(\frac{n|\det A|}{2m}\right)$$

4. As per simple graph with order n > 2 having m edges--(with equality holds iff $G \cong \frac{n}{2}K_2$ (n as even) or $G \cong \overrightarrow{K_n}$.)

$$E\,(G) \geq \sqrt{2m + n(n-1)|\det A|^{\frac{n}{2}} + \frac{4}{(n+1)(n+4)}\left[\sqrt{\frac{2m}{n}} - \left(\frac{2m}{n}\right)^{1/4}\right]^2}$$

5. As per the vertices

E (G) ≥ 2 (n-1)

Upper bounds

1. On the basis of vertices and edges-(with equality achieved only in the cases where G is consider as empty graph or else one regular graph)

$$E(G) \leq \sqrt{2mn}$$

2. If $2m \geq n$ and G as graph with n vertices having m edges-(With equality holding if and only if G is either $\frac{n}{2}K2$, Kn or else non complete connected regular graph with 2 non-trivial eigen values mutually along with absolute value) i.e $\sqrt{\frac{\left[2m-\left(\frac{2m}{n}\right)^2\right]}{n-1}}$

$$E(g) \leq \frac{2m}{n} + \sqrt{(n-1)\left[2m-\left(\frac{2m}{n}\right)^2\right]}$$

3. If $2m \leq n$ and G is graph with vertices and Edges as {n,m} (With equality holding iff G is put out of joint union of edges and cut off vertices)

$$E(G) \leq 2m$$

4. In terms of vertices

$$E(G) \leq \frac{n(\sqrt{1}+\sqrt{n})}{2}$$

5. As per G as bipartite graph with n vertices, where n> 2

$$E(G) \leq \frac{n(\sqrt{n}+\sqrt{2})}{\sqrt{8}}$$

IV. ENERGY AND BOUNDS OF FUZZY GRAPH

Consider P as a nonempty set. The fuzzy subset of P is a function $\sigma : P \to [0,1]$ where σ is called the membership function $\sigma(v)$ is called the membership of v where v belongs to the set P. Fuzzy relation is defined as matrix which is known to be Fuzzy relation matrix

$$M = [m_{ij}] \text{ here } m_{ij} = \mu(v_i, v_j)$$

Here $\mu(v_i, v_j)$ represents the strength of relationship among v_i and v_j. [13]

Adjacency matrix A of fuzzy graph G = (P, σ, μ) is a (n x n) medium matrix denoted as

$$A = [m_{ij}] \text{ here } m_{ij} = \mu(v_i, v_j)$$

Let us take a fuzzy graph G: (P, σ, μ)
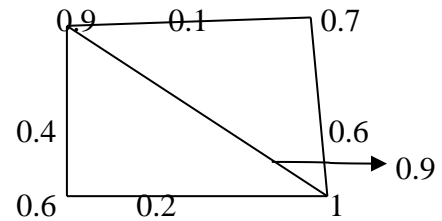
Figure (1)

Adjacency matrix of above figure (1) is

$$A = \begin{bmatrix} 0 & 0.1 & 0.9 & 0.4 \\ 0.1 & 0 & 0.6 & 0 \\ 0.9 & 0.6 & 0 & 0.2 \\ 0.4 & 0 & 0.2 & 0 \end{bmatrix}$$

* The Eigen values of a Fuzzy graph G known as the Eigen values of its own adjacency matrix A.

* Energy of Fuzzy graph G known as sum of absolute values of Eigen values of G. It is denoted by E(G). [14]

Eigen values of adjacency matrix A in the above matrix is given by -

[-1.0464, -0.3164, 0.1174, 1.2454]

For the above graph E (G) {figure 1} = 1.0464 + 0.3164 + 0.1174 + 1.2454 = 2.7256

BOUNDS

If we consider weighted graph G of order n with edges $e_1, e_2 \dots e_n$, each edge with nonzero weight w(e_i),then

$$E(G) \leq 2\sum_{i=1}^{m}|w(e_i)|$$

where equality holds iff each of connected part of G has the majority two vertices.

If w (e_i) ∈ [0,1] then it become particular case of fuzzy graph.

We can restate theorem for fuzzy graph as---

If G= (P, σ, μ) fuzzy graph having $|P| = n$, $\mu^* = \{e_1, \dots e_m\}$ then

$$E(G) \leq 2\sum_{i=1}^{m}\mu(e_i)$$

With respect to the membership values of vertices---

$$E(G) \leq (n-1)\sum_{i=1}^{n}\sigma(v_i)$$

If G^* as a cycle and $\mu^* = \{e_1, \dots e_n\}$ then

$$E(G) \leq 2\sum_{i=1}^{m}\sigma(v_i) : \quad v_i \in P, i = 1,2 \dots n.$$

In terms of strength of the relation we can improve it as ----

If G = (P, σ, μ) as a fuzzy graph having $|P| = n$ and $\mu^* = \{e_1, \dots e_m\}$. If $m_i = \mu(e_i)$ is the power

of relation linked with i^{th} edge then equation (1) is----

$$\sqrt{2 \sum_{i=1}^{m} m_i^2 + n(n-1)|A|^{\frac{2}{n}}} \leq E(G) \leq$$
$$\sqrt{2(\sum_{i=1}^{m} m_i^2)n}$$

For the graph in figure (1) ---
E (G) = 2.7256
Lower bounds = 2.3238
Upper bounds = 3.3226
    i.e.   2.3238< 2.7256 < 3.3226

So we have satisfied equation (1) for the graph in figure (1).

V.   APPLICATION OF FUZZY GRAPH

Let us consider an example of Fuzzy graph from reality. Take an example of social network of five friends named A, B, C, D, E shown in figure (2) below.. Here the number represents the degree of friendship among each other. [15][16][17][18]
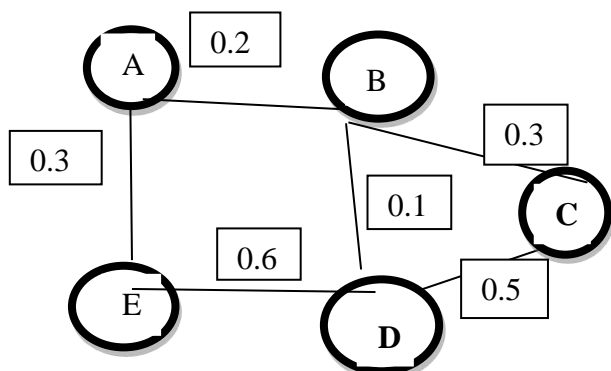
Figure (2)

Here number represents degree of friendship. The strong point of path is considered as weight (the membership value) of lowest arc of the path between two vertices.

Strength of connectedness among any two vertices r and s is definite as maximum of the strength of every paths between two vertices. It is denoted by $CONN_G(x, y)$

In graph {figure (2)} ---

Path and strengths between two friends A and D are

Path number	Strength
A→ B → D	0.1
A→ B → C → D	0.2
A→ E → D	0.3

$CONN_G(x, y) = \max \{0.1, 0.2, 0.3\}=0.3$
So the strongest path is A→ $E \to D$

VI. CONCLUSION

We discussed basic concepts about fuzzy graphs, its energy and analysis in social network. In future this concept and spectra of fuzzy graphs may be applied to various real life problems and can be discussed in forthcoming papers.

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An Unsteady MHD Mixed Convection Flow Pattern of Casson Fluid through Past Vertical Porous Plate with Radiation and Chemical Reaction

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ABSTRACT

This manuscript reveals a detailed numerical study on the influence of radiation, radiation absorption and chemical reaction on unsteady magneto hydrodynamic free convective flow of a heat generating Casson fluid past an oscillating vertical plate surrounded in a porous medium in the presence of constant wall temperature and concentration. The non dimensional governing equations along with the corresponding boundary conditions are solved using finite difference method numerically. The impact of various emerging flow parameters on velocity, temperature and concentration are presented graphically and analyzed. A comparison is done with published results in order to validate the present methodology. Expressions for skin-friction, Nusselt number and Sherwood number are also obtained.

Keywords : Casson fluid, MHD, porous medium, heat and mass transfer, chemical reaction, radiation and heat generation.

I. INTRODUCTION

Several natural phenomena as well as technological issues are liable to the analysis of MHD concepts. Geophysics encounters magnetohydrodynamic characteristics in the relations of magnetic fields and conducting fluids. Engineers make use of MHD principle in pumps designing, space vehicle propulsion, thermal enrichment, organize and re-entry in creating latest systems of power generation etc. The study of MHD is relatively significant in the field of aerodynamics due to the fact that the temperature that occurs in such flight speeds is adequate to disconnect or ionize the air considerably and the motion of such ionized air may be restricted by applying proper magnetic field. During the last decades, incompressible viscous fluid flows and heat transfer phenomena in the presence of porous medium have acknowledged great attention owing to the plenty of practical applications in manufacturing and chemical processes. The curiosity in mixed convection boundary layer flows of visco-elastic fluid is growing to a large extent due to its numerous practical issues in industry, chemical and manufacturing technology. Based on this literature a large number of studies appeared. Chandra Reddy et al. [1] reported an analytical and numerical study on thermal and solutal buoyancy effect on MHD boundary layer flow of a visco-elastic fluid past a porous plate with varying suction and heat source in

the presence of thermal diffusion. Muthucumaraswamy and Velmurugan [2] considered theoretical study of heat transfer effects on flow past a parabolic started vertical plate in the presence of chemical reaction of first order. Guruvi Reddy et al. [3] established and analyzed magneto-convetive and radiation absorption fluid flow past an exponentially accelerated vertical porous plate with variable temperature and concentration. Umamaheswar et al. [4] examined unsteady magneto hydrodynamic free convective double-diffusive viscoelastic fluid flow past an inclined permeable plate in the presence of viscous dissipation and heat absorption. Kandasamy et al. [5] considered and studied chemical reaction heat and mass transfer on MHD flow over a vertical stretching surface with heat source and thermal stratification effects. Lin et al. [6] established and analyzed magneto hydrodynamics thermo capillary Marangoni convection heat transfer of power-law fluids driven by temperature gradient. Sinha and Mondal [7] investigated influence of slip velocity on magneto hydrodynamic flow of blood and heat transfer through a permeable capacity. Sulochana and Samrat [8] considered an unsteady MHD radiative flow of a nanoliquid past a permeable stretching sheet. Chamkha et al. [9] considered unsteady MHD free convection flow past an exponentially accelerated vertical plate with mass transfer, chemical reaction and thermal radiation. MadhusudhanRao et al. [10] put an unsteady MHD free convective heat and mass transfer flow past a semi-infinite vertical permeable moving plate with heat absorption radiation chemical reaction and Soret effects. Misra and Sinha [11] analyzed an effect of thermal radiation on MHD flow of blood and heat transfer in a permeable capillary in stretching motion. Tokis[12] discussed free convection and mass transfer effects on the magneto hydrodynamic flows near a moving plate in a rotating medium. Ahmed and Kalita [13] considered magneto hydrodynamic transient flow through a porous medium bounded by a hot vertical plate in presence of radiation: a theoretical analysis. Mehdi et al.[14] examined the free convective heat and mass transfer

for MHD fluid flow over a permeable vertical stretching sheet in the presence of the radiation and buoyancy effects. Aziz and Aziz [15] analyzed MHD flow of a third grade fluid in a porous half space with plate suction or injection

II. FORMULATION OF THE PROBLEM

The unsteady free convection heat and mass transfer flow of a well-known non-Newtonian fluid, namely Walters B visco-elastic fluid past an infinite vertical porous plate, embedded in a porous medium in the presence of thermal radiation, oscillatory suction as well as variable permeability is considered. In addition to this the existence of heat generation / absorption is also considered. A uniform magnetic field of strength B0 is applied perpendicular to the plate. Let x* axis be taken along with the plate in the direction of the flow and y* axis is normal to it. Let us consider the magnetic Reynolds number is much less than unity so that the induced magnetic field is neglected in comparison with the applied transverse magnetic field. The basic flow in the medium is, therefore, entirely due to the buoyancy force caused by the temperature difference between the wall and the medium. It is assumed that initially, at t* ⩽ 0, the plate as fluids are at the same temperature and concentration. When t*>0, the temperature of the plate is instantaneously raised to T * and the concentration of the species is set to C*. Under the above assumption with usual Boussinesq's approximation, the governing equations and boundary conditions are given by V= UH(t)cos(ωt)i (or) V =Usin(ωt)i Where H(t) is the unit step function, constant U is the amplitude of the plate oscillations, i is the unit vector in the vertical flow direction and ω is the frequency of oscillation of the plate. At the same time , the plate temperature is raised to Tw which is thereafter maintained constant.The tensor of the Casson fluid can be written as , where π= eijeij and eij is the (i,j)th component of deformation rate, π is the product of the component of deformation rate with itself , πc is the critical value of this product based on the non-

Newtonian fluid, μB is the plastic dynamic viscosity of its fluid and   is yield stress of the non-Newtonian fluid. Before forming the governing equations we have taken some assumptions that are unidirectional flow, one dimensional flow, free convection, rigid plate, incompressible flow, unsteady flow, non-Newtonian flow, oscillating vertical plate and viscous dissipation term in the energy equation is neglected. Considering the above assumptions we have formed the following set of partial differential equations.

$$\rho \frac{\partial u'}{\partial t'} = \mu_\beta \left(1 + \frac{1}{\gamma}\right)\frac{\partial^2 u'}{\partial y'^2} - \sigma B_0^2 u' - \frac{\mu \phi}{k_1} u' + \rho g \beta (T' - T_\infty) + \rho g \beta^* (C' - C_\infty) \quad (1)$$

$$\rho C_p \frac{\partial T'}{\partial t'} = k \frac{\partial^2 T'}{\partial y'^2} - \frac{\partial q_r}{\partial y} + Q'(T' - T_\infty) + Q_1(C' - C_\infty) + \sigma B_0^2 u'^2 \quad (2)$$

$$\frac{\partial C'}{\partial t'} = D \frac{\partial^2 C'}{\partial y'^2} - Kr'(C' - C_\infty) \quad (3)$$

Cogley et al. have shown that, in the optically thin limit for a non-gray gas near equilibrium, the radiative heat flux is represented by the following form:

$$\frac{\partial q_r}{\partial y'} = 4(T' - T_\infty)I \quad \text{Where} \quad I = \int K_{\lambda w} \frac{\partial e_{b\lambda}}{\partial T^*} d\lambda$$

The initial and boundary conditions are

$$\left.\begin{array}{ll} t' < 0 : u' = 0, T' = T_\infty, C' = C_\infty & \text{for all } y' < 0 \\ t' \geq 0 : u' = u_0 \sin(w't'), T' = T_W, C' = C_W & \text{at } y' = 0 \\ \quad u' \to 0, T' \to T_\infty, C' \to C_\infty & \text{as } y' \to \infty \end{array}\right\} \quad (4)$$

On introducing the following non-dimensional quantities

$$u = \frac{u'}{u_0}, \quad t = \frac{t' u_0^2}{v}, \quad y = \frac{y' u_0}{v}, \quad \theta = \frac{T' - T_\infty}{T_w - T_\infty}, \quad C = \frac{C' - C_\infty}{C_w - C_\infty}$$

$$Gr = \frac{v g \beta (T_w - T_\infty)}{u_0^3}, \quad \text{(Grashof number)},$$

$$Gc = Gr = \frac{v g \beta^* (C_w - C_\infty)}{u_0^3}, \quad \text{(Modified Grashof number)}$$

$$K = \frac{k_1 u_0^2}{\phi v^2}, \quad \text{(Permeability parameter)},$$

$$M = \frac{\sigma B_0^2 v}{\rho u_0^2}, \quad \text{(Magnetic parameter)}$$

$$\Pr = \frac{v \rho C_p}{k}, \quad \text{(Prandtl number)},$$

$$Ec = \frac{u_0^2}{C_p(T_w - T_\infty)}, \quad \text{(Eckert number)},$$

$$Sc = \frac{v}{D}, \quad \text{(Schmidt number)}$$

$$Q = \frac{Q' v}{\rho C_p u_0^2}, \quad \text{(Heat absorption parameter)},$$

$$R = \frac{4 v I}{\rho C_p u_0^2}, \quad \text{(Radiation parameter)}$$

$$\chi = \frac{Q_1 v (C_w - C_\infty)}{\rho C_p u_0^2 (T_w - T_\infty)}, \quad \text{(Radiation absorption parameter)},$$

$$Kr = \frac{Kr' v}{u_0^2}, \quad \text{(Chemical reaction parameter)},$$

$$\gamma \quad \text{(Casson parameter)}$$

In terms of the above non-dimension quantities, Equations (1)-(3) reduces to

$$\frac{\partial u}{\partial t} = \left(1 + \frac{1}{\gamma}\right)\frac{\partial^2 u}{\partial y^2} - M u - \frac{1}{K} u + Gr \theta + Gm C \quad (5)$$

$$\frac{\partial \theta}{\partial t} = \frac{1}{\Pr}\frac{\partial^2 \theta}{\partial y^2} - R \theta + Q \theta + \chi C + M Ec u^2 \quad (6)$$

$$\frac{\partial C}{\partial t} = \frac{1}{Sc}\frac{\partial^2 C}{\partial y^2} - Kr C \quad (7)$$

The corresponding initial and boundary conditions are:

$$\left.\begin{array}{ll} t < 0 : u = 0, T = 0, C = 0 & \text{for all } y < 0 \\ t \geq 0 : u = \sin(wt), \theta = 1, C = 1 & \text{at } y = 0 \\ \quad u \to 0, T \to 0, C^* \to 0 & \text{as } y \to \infty \end{array}\right\} \quad (8)$$

III. METHOD OF SOLUTION

Equations (5)-(7) are coupled non-linear partial differential equations and are to be solved by using the initial and boundary conditions (8). However exact solution is not possible for this set of equations and hence we solve these equations by finite-difference method. The equivalent finite difference schemes of equations for (5)-(7) are as follows:

$$\frac{u_{i,j+1} - u_{i,j}}{\Delta t} = \left(1 + \frac{1}{\gamma}\right)\left(\frac{u_{i-1,j} - 2u_{i,j} + u_{i+1,j}}{(\Delta y)^2}\right) - M u_{i,j} - \frac{1}{K} u_{i,j} + Gr \theta_{i,j} + Gc C_{i,j} \quad (9)$$

$$\frac{\theta_{i,j+1} - \theta_{i,j}}{\Delta t} = \frac{1}{\Pr}\left(\frac{\theta_{i-1,j} - 2\theta_{i,j} + \theta_{i+1,j}}{(\Delta y)^2}\right) - R \theta_{i,j} + Q \theta_{i,j} + \chi C_{i,j} + MEc(u_{i,j})^2 \quad (10)$$

$$\frac{C_{i,j+1} - C_{i,j}}{\Delta t} = \frac{1}{Sc}\left(\frac{C_{i-1,j} - 2C_{i,j} + C_{i+1,j}}{(\Delta y)^2}\right) - Kr C_{i,j} \quad (11)$$

Here, index i refer to y and j to time. The mesh system is divided by taking Δy = 0.04. From the initial condition in (8), we have the following equivalent:

$u(i,0)=0,\ \theta(i,0)=0, C(i,0)=0\ \textit{for all i}$ (12)

The boundary conditions from (8) are expressed in finite-difference form as follows

$u(0,j)=1,\theta(0,j)=1, C(0,j)=1\ \textit{for all j}$

$u(i_{max},j)=\sin(w*(j-1)*\Delta t),\theta(i_{max},j)=1, C(i_{max},j)=1\ \textit{for all j}$ (13)

(Here i_{max} was taken as 201)

First the velocity at the end of time step viz, u (i,j+1), (i=1,201) is computed from (9) in terms of velocity, temperature and concentration at points on the earlier time-step. Then θ (i, j +1) is computed from (10) and C (i, j +1) is computed from (11). The procedure is repeated until

t = 0.05 (i.e. j = 500). During computation Δt was chosen as 0.0001.

Skin-friction: The skin-friction in non-dimensional form is given by

$$\tau = -\left(1+\frac{1}{\gamma}\right)\left(\frac{du}{dy}\right)_{y=0},\ \textit{where } \tau^* = \frac{\tau}{\rho u_0^2}$$

Rate of heat transfer: The dimensionless rate of heat transfer is given by $Nu = -\left(\frac{d\theta}{dy}\right)_{y=0}$

Rate of mass transfer: The dimensionless rate of mass transfer is given by $Sh = -\left(\frac{dC}{dy}\right)_{y=0}$

IV. RESULT AND DISCUSSION

The influence of different physical parameters like Grashof number, modified Grashof number, magnetic parameter, thermal radiation, Prandtl number, Eckert number, Soret number and Schmidt number on velocity, temperature and concentration is discussed by using graphical representations. The general nature of the velocity profile is parabolic with picks near the plate. Figure 1 show that the velocity enhances for rising values of magnetic parameter. The effect of Prandtl number on velocity is displayed in figure 2. The Prandtl number is a dimensionless number approximating the ratio of momentum diffusivity (kinematic viscosity) and thermal diffusivity. The fluid velocity decreases for increasing values of Prandtl number. This is due to the effect of transverse magnetic field, which has the nature of reducing the velocity. These results are similar to that of Mishra et al. [13]. Figures 3, 4

depict the velocity variations under the effect of Grashof number and modified Grashof number respectively. The velocity of the flow grows when the values of these parameters increases. Figure 5 represents the impact of porous medium on velocity. It is evident that the velocity enhances for increasing values of porosity parameter. The changes in velocity under the existence of heat source / sink are depicted in figure 6. It is noticed that the velocity enhances in the presence of heat source where as it falls down in the case of heat sink. The variation in velocity under the influence of Schmidt number is shown in figure 7. It is evident that velocity comes down when the values of Schmidt number are increased. The existence of thermal diffusion results in improving the flow velocity which is clearfrom figure 8. These results coincide with that of Chandra Rddy et al.[1].The temperature decreases in the presence of thermal radiation which is shown in figure 9. The effect of Prandtl number on temperature is presented in figure 10. The temperature decreases for increasing values of Prandtl number. Figure 11 reveals the same nature as that of velocity under the influence of heat source/sink. Figure 12 depicts the influence of Eckert number on temperature. It is observed that the temperature rises with increasing values of Eckert number.
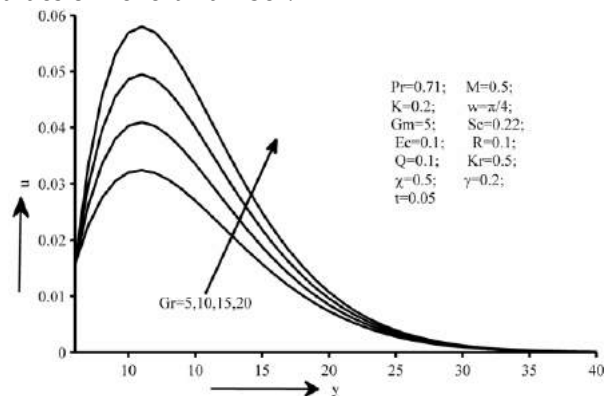
Fig 1: Effect of Grashof number on velocity
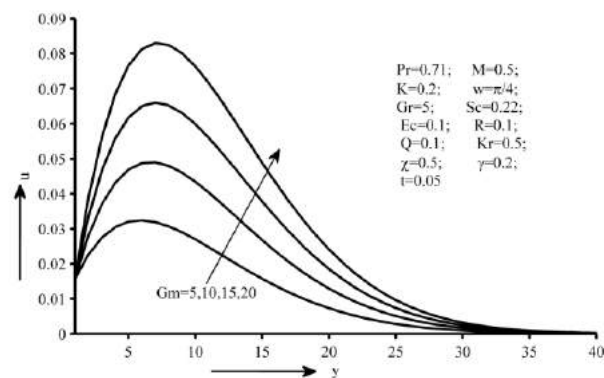
Fig 2: Effect of modified Grashof number on velocity
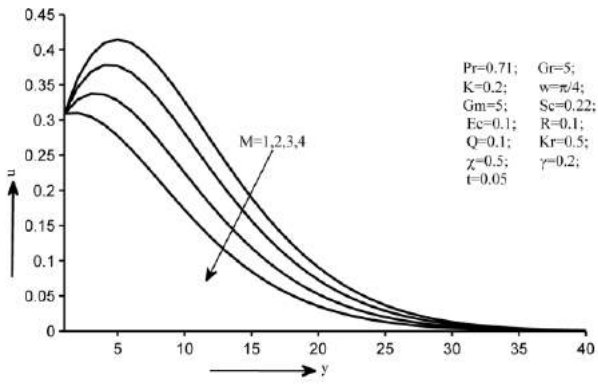
Fig 3: Effect of magnetic parameter on velocity

Fig 7: Effect of heat source on temperature

Fig 4: Effect of permeability parameter on velocity
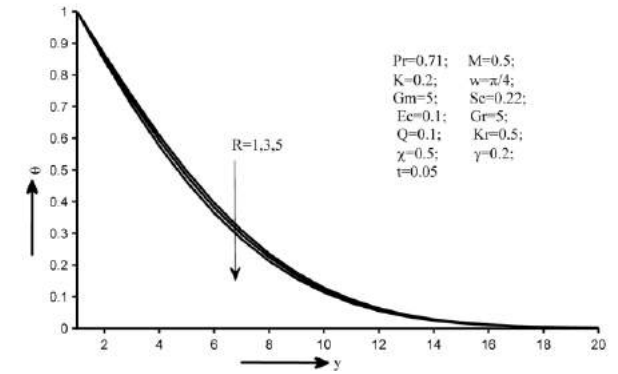
Fig 8: Effect of radiation parameter on velocity

Fig 5: Effect of Casson parameter on velocity
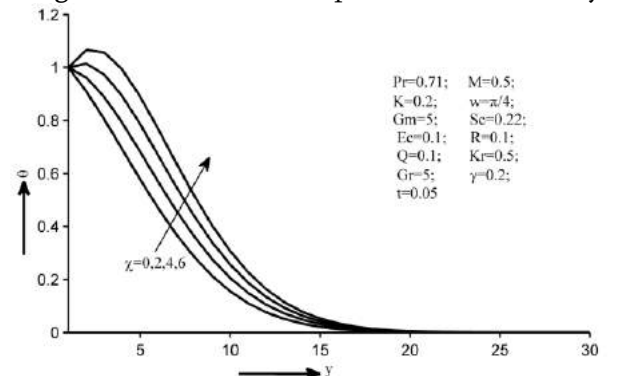
Fig 9: Effect of radiation absorption parameter

Fig 6: Effect of Prandtl number on temperature
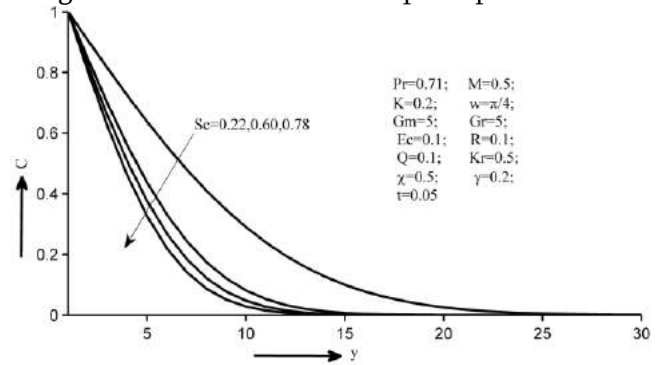
Fig 10: Effect of Schmidt number on concentration
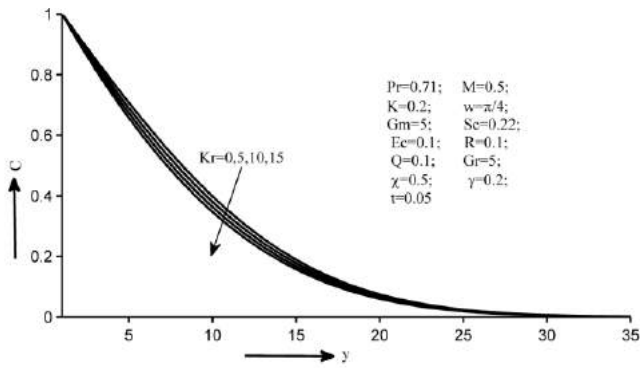
Fig 11: Effect of Chemical reaction parameter on concentration
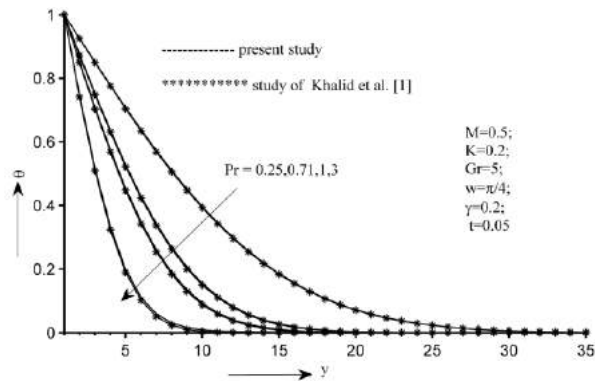
Fig 12: Comparison of present study with the study of in the absence of Gm,Q,R,Ec,χ,Sc,Kr

Table.2: Variations in Nusselt number

Pr	Q	R	χ	Nu
0.71	0.8	0.8	0.1	4.4626
1	0.8	0.8	0.1	5.3128
3	0.8	0.8	0.1	8.6469
7.1	0.8	0.8	0.1	11.1283
0.71	0.1	0.8	0.1	5.3356
0.71	0.3	0.8	0.1	5.3291
0.71	0.5	0.8	0.1	5.3256
0.71	1	0.8	0.1	5.3024
0.71	0.8	0.5	0.1	5.4492
0.71	0.8	1	0.1	5.6524
0.71	0.8	2	0.1	5.8672
0.71	0.8	0.8	1	4.4124
0.71	0.8	0.8	2	3.5264
0.71	0.8	0.8	3	3.0564
0.71	0.8	0.8	4	2.5648

Table.3: Variations in Sherwood number

Sc	Kr	Sh
0.22	0.8	3.5484
0.60	0.8	4.6542
0.78	0.8	4.8492
0.96	0.8	5.5321
0.22	0.1	3.5234
0.22	0.3	3.6134
0.22	0.5	3.7568
0.22	0.9	3.8829

V. CONCLUSION

An analytical solution is investigated on MHD boundary layer flow of a visco-elastic fluid past a porous plate with varying suction and heat source/sink in the presence of thermal radiation and diffusion. The governing equations for the velocity field, temperature and concentration by finite difference method. The main findings of this study are as follows.

- Velocity of the fluid reduces for increasing values of Prandtl number and magnetic parameter.
- Temperature of the fluid grows for rising values of Eckert number, but a reverse effect is noticed in the case of Prandtl number and radiation absorption parameter.
- The concentration reduces with an increase in Schmidt number.
- The existence of heat source leads to enhance the temperature and a reverse trend is observed in the presence of heat sink.
- Skin friction decreases with an increase of Eckert number and Schmidt number but a reverse effect is noticed in the case of radiation absorption parameter and magnetic parameter.
- Nusselt number increases as radiation absorption parameter increases but in the case of Eckert number it decreases.
- Sherwood number increases with an increase in Schmidt number.

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Totally Umbilical Slant Submanifolds of S- manifolds

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ABSTRACT

In this paper, we study slant submanifolds of S-manifolds which are totally umbilical. We show that every totally umbilical proper slant submanifold of a S-manifold is either totally geodesic or if submanifold is not totally geodesic then we derive a formula for slant angle.

2010 Mathematics Subject Classification: 53C42, 53C25, 53C40.

Keywords : Slant submanifold, totally umbilical, S-manifold.

I. INTRODUCTION

Blair [2], introduced the notion of an S-manifold equipped with a normal framed metric structure as a generalization of an almost Hermitian structure and almost contact metric structures. We refer to [30] for geometry of framed metric structures and related references cited therein.

On the other hand, as a natural generalization to the holomorphic and totally real subman- ifolds, Chen [9], introduced and studied slant submanifolds of an almost Hermitian manifolds. The contact version of slant submanifolds was introduced by Lotta [18]. Later, the study of slant submanifolds was enriched by the authors of [7, 11, 12, 14, 21, 23, 28] and many others. Recently Carraizo et. al. [6] defined and studied slant submanifolds of S-manifolds, when the second fundamental form is totally geodesic, f-umbilical, totally umbilical and austere submanifolds. Motivated by the above studies, in this paper we study totally umbilical slant submanifolds and is organized as follows: In section-2, we recall the notion of S-manifold, submanifold and formulas, basic ideas regarding it. Section 3 is the main section

of this paper. Here, we derived the classification results of slant submanifolds of S-manifold, when the submanifold is totally umbilical.

II. PRELIMINARIES

Let $\tilde{M}$ be a (2n + s)-dimensional Riemannian manifold. It is said to be an S-manifold, if there exist on $\tilde{M}$ an J-structure [29] of rank 2n and s global vector fields $\xi_1, \xi_2, \cdots, \xi_s$ (structure vector fields), $\eta^1, \eta^2, \cdots, \eta^s$ are s 1-forms and g is a Riemannian metric on M such that [29]

$$J^2 = -I + \eta^\alpha \otimes \xi_\alpha, \eta(\xi) = 1, J\xi_\alpha = 0, \eta^\alpha \cdot J = 0, \quad (2.1)$$

$$g(JU, JV) = g(U, V) - \sum_\alpha \eta^\alpha(U)\eta^\alpha(V), \ g(U, \xi_\alpha) = \eta^\alpha(U), \quad (2.2)$$

$$\Omega(U, V) = g(U, JV) = -\Omega(V, U) \quad (2.3)$$

For any $U, V \in T\tilde{M}, \alpha = 1, 2, \cdots, s$.

An J-structure is called normal if

$$[J, J] + 2d\eta^\alpha \otimes \xi_\alpha = 0, \quad (2.4)$$

And an S-structure [2] if it is normal and

$$\Omega = d\eta^\alpha, \quad (2.5)$$

$\forall \alpha \in 1, 2, \cdots, s$.

When s = 1, a framed metric structure is an almost contact metric structure, while an S-structure is a Sasakian structure. When s = 0, a framed metric structure is an almost Hermitian structure, a normal framed metric structure is a Hermitian structure, while an S-structure is a Kaehler structure.

If an J-structure on $\tilde{M}$ is an S-structure then it is known that [2]

$$(\tilde{\nabla}_U J)V = \sum_\alpha (g(JU,JV)\xi_\alpha + \eta^\alpha(V)J^2 U), \quad (2.7)$$

$$\tilde{\nabla}_U \xi_\alpha = -JU. \quad (2.8)$$

Let M be an isometrically immersed submanifold of an S-manifold $\tilde{M}$, we denote by the same symbol g the induced metric on M . Let TM be the set of all vector fields tangent to M and $T^\perp M$ is the set of all vector fields normal to M. Then, the Gauss and Weingarten formulae are given by

$$\tilde{\nabla}_U V = \nabla_U V + \sigma(U,V), \quad \tilde{\nabla}_U Y = -A_Y U + \nabla^\perp_U Y, \quad (2.8)$$

for any U,V ∈ TM ,Y ∈ $T^\perp$ M , where ∇ (resp. ∇⊥) is the induced connection on the tangent bundle TM (resp. normal bundle $T^\perp$ M) [10]. The shape operator A is related to the second fundamental form σ of M by

$$g(A_Y U, V) = g(\sigma(U,V), Y), \quad (2.9)$$

Now, for any $x \in M$, $U \in T_x M$ and $\in T_x^\perp M$, we put

$$\varphi U = TX + NX, \quad \varphi Y = tV + nV, \quad (2.10)$$

where TX (resp. NX) is the tangential (resp. normal) component of φU, and tV (resp. nV) is the tangential (resp. normal) component of φY. From (2.3) and (2.10)

$$g(TX, V) + g(U, TY) = 0, \quad (2.11)$$

for each U,V ∈ TM ,Y ∈ $T^\perp$ M . The covariant derivatives of the tensor fields T, N, t and n are defined as

$$(\tilde{\nabla}_U \varphi)V = \tilde{\nabla}_U \varphi V - \varphi(\tilde{\nabla}_U V), \quad (2.12)$$

$$(\tilde{\nabla}_U T)V = \nabla_U TV - T(\nabla_U V), \quad (2.13)$$

$$(\tilde{\nabla}_U N)V = \nabla_U NV - N(\nabla_U V). \quad (2.14)$$

$$(\tilde{\nabla}_U t)Y = \nabla_U tY - t(\nabla_U Y). \quad (2.15)$$

$$(\tilde{\nabla}_U n)Y = \nabla_U nY - n(\nabla_U Y). \quad (2.16)$$

Now, on a submanifold of an S-manifold by equations (2.7) and (2.8) we get

$$\nabla_U \xi = -PU \quad (2.17) \quad \text{And}$$

$$\sigma(U,\xi) = -FU, \quad (2.18)$$

for each $U \in TM$. Further from equation (2.7) and (2.10)

$$A_Y \xi = tV, \eta(A_Y U) = 0, \quad (2.19)$$

for each $Y \in T^\perp M$. On using equations (2.6), (2.8), (2.10) and (2.12)-(2.14), we obtain

$$(\tilde{\nabla}_U T)V = A_{NV} U + t\sigma(U,V) + \sum_\alpha \{g(TU,TV)\xi_\alpha + \eta^\alpha(V)(T^2 U + tNU)\}, \quad (2.20)$$

$$(\tilde{\nabla}_U N)V = n\sigma(U,V) - \sigma(U,TV) + \eta^\alpha(V)(NTU + nNU) \quad (2.21)$$

submanifold M of an almost contact metric manifold $\tilde{M}$ is said to be totally umbilical if

$$\sigma(U,V) = g(U,V)H, \quad (2.22)$$

where H is the mean curvature vector of M. Furthermore, a submanifold M is called totally geodesic, if σ(U,V)=0 for all U, V ∈ Γ(TM) and if H = 0, then M is minimal in $\tilde{M}$.

III. SLANT SUBMANIFOLDS OF S-MANIFOLD

In this section, we consider M is a proper slant submanifold of an S-manifold $\tilde{M}$. We always consider such submanifolds tangent to the structure vector fields ξ_α.

An immersed submanifold M of an S-manifold $\tilde{M}$ is slant in $\tilde{M}$ if for any x ∈ M and any U ∈ TxM such that U, ξ_α are linearly independent, the angle θ(x) ∈ [0,π/2] between f U and TxM is a constant θ, i.e., θ does not depend on the choice of U and x ∈ M, θ is called the slant angle of M in $\tilde{M}$. Invariant and anti-invariant submanifolds are slant

submanifolds with slant angle θ=0 and θ=π/2 respectively [6]. A slant submanifold which is neither invariant nor anti-invariant is called a proper slant submanifold.

We have the following theorem which characterize slant submanifolds of a f -metric manifold:

Theorem 3.1: Let M be a submanifold of a f-metric manifold $\tilde{M}$, such that $\xi\_\alpha \in TM$.

Then, M is slant if and only if there exists a constant $\lambda \in [0,1]$ such that
$T^2 = -\lambda(I - \sum_{\alpha=1}^{s} \eta^\alpha \otimes \xi_\alpha)$. (3.1)

Further more, if θ is the slant angle of M, then

$$\lambda = \cos^2 \theta.$$

From [6], for any U, V tangent to M , we can easily obtain the results for an S-manifold $\tilde{M}$,

$g(TU, TV) = \cos^2 \theta \{ g(U,V) - \sum_{\alpha=1}^{s} \eta^\alpha(U)\eta^\alpha(V) \}$ (3.2)

$g(NU, NV) = \sin^2 \theta \{ g(U,V) - \sum_{\alpha=1}^{s} \eta^\alpha(U)\eta^\alpha(V) \}$ (3.3)

Theorem 3.2. Let M be a totally umbilical slant submanifold of an S-manifold $\tilde{M}$, then the following statements are equivalent:

H∈ μ ;

either M is trivial or Sasakian or Anti-invariant submanifold of $\tilde{M}$.

Proof: For any U, V ∈ TM , from equation (2.20), we have

$(\tilde{\nabla}_U T)V = A_{NV}U + t\sigma(U,V)$

$+ \sum_{\alpha} \{ g(TU,TV)\xi_\alpha$

$+ \eta^\alpha(V)(T^2 U + tNX) \}.$ (3.4)

Taking the inner product in (3.4) with ξ_α, by virtue of (2.11) we get

$g(\nabla_U TV, \xi_\alpha) = g(\sigma(U, \xi_\alpha), NV)$
$+ g(t\sigma(U,V), \xi_\alpha) + sg(TU, TV).$

As M is totally umbilical slant submanifold of $\tilde{M}$, then from equation (2.22) the above equation becomes

$-g(TV, \nabla_U \xi_\alpha) = g(H, NV)\eta^\alpha(U) +$
$g(U,V)g(tH, \xi_\alpha) + sg(TU, TV).$

Then from equations (2.10), (2.17) and (3.2), the above equation takes the form

$$\cos^2 \theta (s-1) \left[g(U,V) - \sum_{\alpha} \eta^\alpha(U)\eta^\alpha(V) \right]$$
$$= -g(H, NV)\eta^\alpha(U). \qquad (3.5)$$

If H ∈ μ, then right hand side of the equation (3.5) is identically zero. Hence statement (ii) holds.

Conversely, if (ii) holds then from (3.5) we get H ∈ μ. This completes the proof of the theorem.

Theorem 3.3. Let M be a totally umbilical proper slant submanifold of an S-manifold $\tilde{M}$, such that H, ∇⊥X H ∈ μ, for all X ∈ TM . Then, either M is totally geodesic;

(i) or the slant angle $\theta = \tan^{-1}\left(\sqrt{\frac{-g(U,V)}{\eta^\alpha(U)\eta^\alpha(V)}} \right)$.

Proof: Let $U, V \in TM$, we have

$$\tilde{\nabla}_U \phi V - \phi(\tilde{\nabla}_U V) = -\phi U.$$

Applying (2.8), (2.10) and from the fact that M is totally umbilical proper slant submanifold, we obtain

$$\nabla_U TV + g(U, TV)H - A_{NV}U + \nabla_U^\perp - T\nabla_U V$$
$$- N\nabla_U V - g(U,V)\phi H$$
$$= -TU - NU \qquad (3.6)$$

Taking inner product with φH in equation (3.6) yields

$g(U, TV)g(H, \phi H) + g(\nabla_U^\perp NV, \phi H)$
$= g(N\nabla_U V, \phi H)$
$+ g(U,V)g(\varphi H, \varphi H) - \text{g}(NU, \phi H).$

From the fact that H ∈ μ and by virtue of (2.2), we obtain

$$g(\nabla_U^\perp NV, \phi H) = g(U,V)||H||^2. \qquad (3.7)$$

Now, for any U ∈ TM , we have

$$(\tilde{\nabla}_U \varphi)H = \tilde{\nabla}_U \varphi H - \varphi \tilde{\nabla}_U H.$$

Using (2.6) and the fact that H ∈ μ, we get

$$0 = \tilde{\nabla}_U \varphi H - \varphi \tilde{\nabla}_U H.$$

Using equations (2.8) and (2.10), we obtain

$$-A_{\varphi H} U + \nabla_U^\perp \varphi H = -TA_H U - NA_H U + t\nabla_U^\perp H + n\nabla_U^\perp H.$$

Taking inner product with NV in (3.8) for any V ∈ TM and using the fact that n∇⊥U H ∈ ν, (3.8) yields

$$g(\nabla_U^\perp \varphi H, NV) = -g(NA_H U, NV)$$

Applying (2.8) and (3.3), we get

$$g(\tilde{\nabla}_U NV, \phi H) = \sin^2\theta \left[g(U,V) - \sum_\alpha \eta^\alpha(U)\eta^\alpha(V)||H||^2 \right]. \qquad (3.9)$$

In view of (3.7) and (3.9), we obtain

$$\{\cos^2\theta\, g(U,V) - \sin^2\theta\, \eta^\alpha(U)\eta^\alpha(V)\}||H||^2 = 0. \qquad (3.10)$$

Since M is proper slant submanifold, then from (3.10) it follows that either H = 0, that is M is totally geodesic in M or θ is acute angle , then $\theta = \tan^{-1}\left(\sqrt{\frac{-g(U,V)}{\eta^\alpha(U)\eta^\alpha(V)}}\right)$. This completes the proof of the theorem.

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Synergistic Effect of Samarium doped Magnesium Zirconate Photocatalyst for the Degradation of Methylene Blue Dye via Efficient Charge Separation Pathway and its Photoluminescence Studies

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ABSTRACT

In the present work, a well defined Samarium doped Magnesium Zirconate (MgZrO3:Sm3+) nanospheres were synthesized by facile solution combustion method. The prepared material was characterized by FTIR, PL and SEM. FTIR spectra showed broad peaks within 500 cm-1 indicating the presence of metal oxygen bonds. From the UV-Vis DRS results the band gap of MgZrO3:Sm3+ nanomaterials were evaluated and it is observed that, band gap decreases with the increase in concentration of Sm3+ and it was in the range of 5.89 eV-7.17 eV. From the SEM micrographs of the material with different concentration of Sm3+ it was evident that, in all the samples the particles are agglomerated and showed defined spherical morphology. The Photoluminescence studies of the material showed five bands at 360 nm, 397 nm, 442 nm, 487 nm and 535 nm, upon excitation at 290 nm. A detailed investigation on effect of Sm+3 on the PL intensity were studied and photocatalytic activity for the degradation of methylene blue was evaluated.

Keywords : Synergistic Effect, Photocatalysis, Degradation of Methylene Blue, Charge separation, Photoluminescence.

I. INTRODUCTION

Ceramic supported photocatalysts have shown promising activity for air/water purification[1]. These materials are widely explored in the field of wastewater treatment, especially dyes, due to their low cost, recyclability, low toxicity, high thermal stability and the ability to process multi-electron exchange reactions[2]. Many photocatalysts have variable properties that can be modified by doping, size reduction, and so forth. Photocatalysis depends on the generation of charge carriers and the proficient transfer of a hole or electron. The

effectiveness of a photocatalyst is primarily determined by the recombination rates of the photogenerated charge carriers. The recombination rates are generally much faster (nanoseconds) than the interfacial transfer rate (microseconds to milliseconds) where many charge carriers recombine releasing heat energy and reduces the overall quantum efficiency of the photocatalytic process.

Recently S. P. Ratnayake, et al. studied the photocatalytic activity of carbon quantum dots decorated nano zirconia as a highly efficient catalyst for the degradation of methylene blue in water[3]. Higher photocatalytic efficiency due to the coupling

of oxygen ion conduction with the photocatalysis was observed. The improved ionic conduction of oxygen ions at higher temperatures results in better separation of photogenerated charge carriers, thereby improving the overall efficiency of the photocatalytic process. Therefore, introduction of oxygen vacancies or increasing the density of oxygen vacancies at the surface of the photocatalyst can improve the photocatalytic process by effective inhibition of the recombination of electron–hole pairs. The oxygen can be bound to vacancies, which acts as an electron scavenger and can produce superoxide radicals[4], [5].

Zirconium oxide (ZrO2) and magnesium oxide (MgO) were widely used for catalysis [6]–[8] . The catalytic properties and oxide ion conductivity of zirconia originates from its phase and structure. These properties gives rise to oxygen vacancies. Further, ZrO2 has a band gap (3.2-5.0 eV) and works as a suitable photocatalyst [9]. When zirconia is doped elements like Mg, Ca and rare earth elements like dysprosium, europium and samarium, an improvement in photocatalytic activity was ascribed to an enhancement in the mobility of excitons, thus facilitating surface reactions [10]–[12].

II.   CHEMICALS AND INSTRUMENTS

Magnesium nitrate hexahydrate, zirconium oxynitrate, samarium oxide, neodymium oxide and urea were purchased from Merck chemicals and are of analytical reagent grade and used as received without further purification. FTIR spectra were recorded using Bruker spectrometer with specrtral grade KBr. The morphology and structure of the samples were inspected using Zeiss FESEM and Photoluminescent measurements were done using Agilent Cary eclipse Photoluminescent spectrofluoremeter equipped with xenon lamp as the source of radiation.

2.2. Synthesis of samarium doped magnesium zirconate photocatalyst

Samarium doped magnesium were prepared by simple solution combustion method. The precursor Mg(NO3)2.6H2O, ZrO(NO3)2.xH2O, were dissolved in a minimum quantity of water. The samarium oxide (Sm2O3) was digested in concentrated nitric acid then; the digested solution was mixed with the above solution followed by the addition of suitable amount of urea. The final solution obtained was mixed well to homogeneity. Then the solution was subjected to combustion in a preheated muffle furnace at 400°C±10°C, the reaction facilitated with the evolution of gases leaving behind white powder. Thus obtained powder was ground to fine and further calcinated at the same temperature for 3 h. Following the same procedure a series of 3, 5, 7 and 9 mol% of samarium doped magnesium zirconate (SMZ) were prepared and labeled as SMZ-3, SMZ-5, SMZ-7, SMZ-9 and SMZ-11 respectively..

III.   RESULTS AND DISCUSSION

1. Material characterization

FTIR spectra of the SMZ (1-9 mol %) are shown in Figure 1. The IR spectra of the SMZ exhibits a broad band observed at 3420 cm-1 and a small shoulder at 1115 cm-1, corresponding to the O–H stretching and bending vibration of physically absorbed water molecules. Two strong absorption peaks observed at 1520 and 1390 cm-1 are assigned to rocking and wagging vibration transitions of the O–H group. The appearance of a intense band at 500-700 cm-1 is assigned to the Sm–O stretching vibration mode revealing the formation of Sm2O3 nanoparticles, the data obtained was well in match with the literature reported.

SEM images of SMZ and NMZ nanoparticles are as shown in the Figure 5 and 6 respectively. The Figure 2a-2e shows FESEM images of SMZ (1-9 mol%) samples, as observed from the images, it is evident that the particles are of spherical morphology, porous natured and showed considerable

agglomeration, these properties are expected for the material processed via solution combustion reaction.
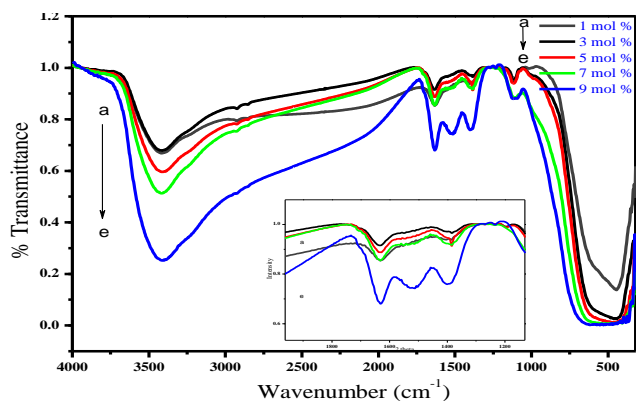
Figure 1: FTIR spectra of Samarium doped magnesium zirconate (1-9 mol %)
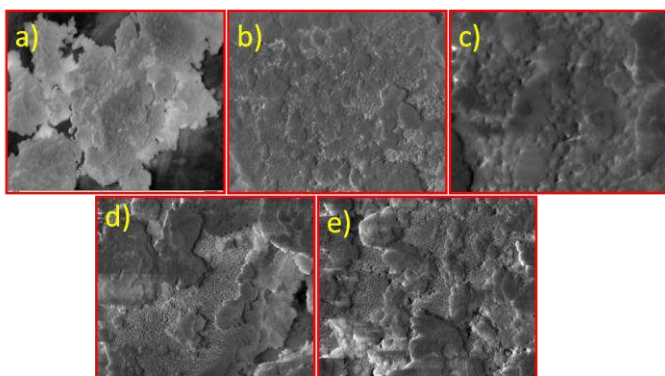
Figure 2: (a) to (e) FESEM images of SMZ samples (1-9 mol %)

2. Photoluminescence studies of samarium doped magnesium zirconate

Photoluminescence emission spectra of SMZ (1-9 mol %) samples were recorded at room temperature. As shown in the Figure 3, the material showed five bands at 360 nm, 397 nm, 442 nm, 487 nm and 535 nm, upon excitation at 290 nm. These transitions are attributed to the defect induced in ZrO2 due to oxygen vacancy defect.
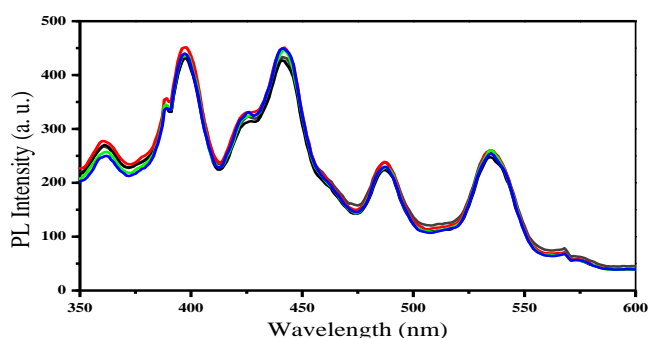
Figure 3: Photoluminescence spectra of SMZ nano particles (1-9 mol %)

3. Effect of photocatalyst dosage

The influence of photocatalyst amount towards methylene blue dye degradation efficiency is shown in Figure 4. It is observed that, increasing the amount of photocatalyst the number of active sites i.e., the available surface area for photocatalysis process increases significantly thereby enhancing the kinetics of dye degradation through the voluminous formation of $O_2^{\cdot}$ and $OH^{\cdot}$ reactive species. To study the optimum amount of samarium doped magnesium zirconate for the efficient dye degradation; a diverse range of photocatalyst quantity (10mg-30mg) was employed. The photocatalysts are equilibrated individually with 20 ppm of methylene blue dye solution (100mL) of pH 3.0. The figure denotes that >98% of dye degradation is achieved by using 30 mg within 2 hours of UV light irradiation. However, beyond 30 mg of the photocatalyst, the degradation efficiency decreases considerably, which is attributed to the excess of catalyst in the reaction medium eventually scatters the light entering into the reaction vessel, thus making it unavailable for dye photodegradation. Hence, 30 mg samarium doped magnesium zirconate photocatalyst was chosen as the appropriate amount for the methylene blue dye mineralization.
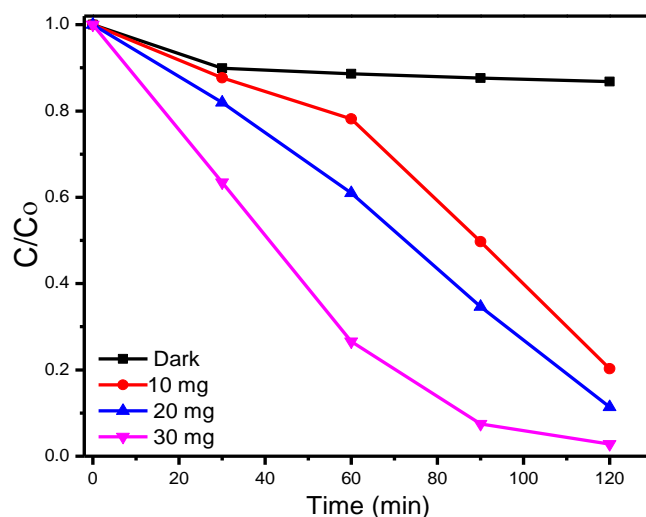
Figure 4: Effect of dosage of the catalyst on the photocatalytic degradation of methylene blue

4. Effect of dye concentration:

The influence of methylene blue dye concentration on the degradation kinetics is depicted in Figure 5.

The plot reveals a first-order kinetics for various concentrations of methylene blue dye solutions (100 mL) ranging from 5 to 25 ppm that are individually irradiated under optimum experimental conditions. In the case of 5 ppm of dye concentration, >99% of the dye molecules are degraded. However, for 10, 15, 20 and 25 ppm of dye concentrations, is noticed to achieve >90% dye degradation. This tendency is attributed to the greater availability of dye molecules in the reactive solution in comparison to surface of the photocatalyst at higher concentrations, which eventually hinders the photon absorption by the photocatalyst for dye degradation process. Furthermore, at higher dye concentrations, these dye molecules exerts shielding effect, hence the incident light suffers reduced path length through the solution medium that eventually leads to poor photocatalytic efficiency. Hence, as a matter of convenience, 20 ppm of methylene blue dye solution is used for photocatalytic studies.
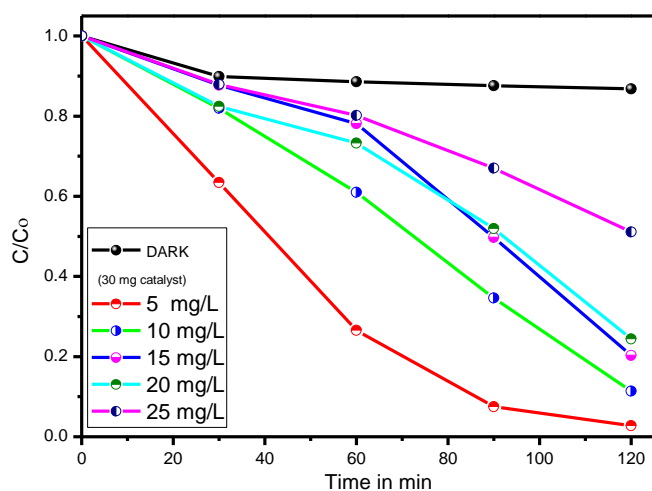
Figure 5: Effect of dye concentration on the photocatalytic degradation of methylene blue

IV. CONCLUSION

The article reports on the facile solution combustion synthesis of structurally ordered sphere-like samarium doped magnesium zirconate with a stoichiometric intrusion of samarium as the dopant. The synthesized material was capable for inducing photocatalytic activity under UV light spectrum, with ultrafast dissipation response. From the dopant stoichiometric combinations, the use of 30 mg of catalyst was found to serve as the efficient photocatalyst material, which is confirmed by various instrumental and experimental parameters. The surface morphology and textural properties of the monolithic photocatalyst are characterized using SEM images, which reveal a highly ordered and continuous sphere-like structure of Mg-O-Zr network pattern. A detailed analytical investigation was performed to evaluate the photocatalytic properties of the synthesized catalyst. The studies reveal that, the photocatalyst materials exhibit excellent UV light induced photocatalytic activity towards rapid dissipation of organic textile dye (methylene blue).

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Influence of Novel Fiber Surface Treatment Method on Morphology and Mechanical Properties of Polypropylene Composites Incorporation of Sisal Fibers

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ABSTRACT

In this study, sisal fibers successfully surface modified by high intensity ultrasound (HIU) and their effects on morphology and mechanical characteristics were investigated for their polypropylene (PP) composites. The SEM analysis shows that after HIU modification, sisal fibers filled PP composites have good compatibility between fibers and PP polymer due to improve the surface roughness. The mechanical properties were significantly enhanced with HIU treated sisal fibers PP composites. The highly cost-effective PP bio-composites reinforced sisal fibers with improved mechanical properties find the potential applications in automotive and other structural engineering industries.

Keywords : Sisalfiber, Polypropylene, Ultrasound, Water Absorption, Morphology

I. INTRODUCTION

In last few years, natural fibers reinforced polymer composites are extensively used in many applications such as home appliances, automotive, etc., owing to their good mechanical properties, biodegradability and economical aspects[1]. Polypropylene (PP) is an important thermoplastic polymer which is extensively used for the production of polymer composites used for applications such as automotive, electrical insulation, home appliances and other structural applications. However, PP has drawbacks such as low tensile, impact and thermal properties[2]. These mechanical and thermal properties of PP polymer can be enhance by filling of fiber materials into the PP matrix[3,4]. It is well known fact that, reinforcement materials such as fibers are withstanding high force applied on the composites.

Nowadays natural fibers are very commonly used for preparation of polymer composites owing to their biodegradability, easy availability, and good mechanical and thermal properties[5–7]. However, due to occurrence of amorphous materials such as hemicellulose, lignin, pectin and other waxy materials on the surface of the natural fibers cause high water absorption and low compatibility with hydrophobic polymer matrices[8–10].

Surface modification is frequently the used method for the elimination of amorphous materials from the surface of natural fibres to convert the hydrophilic nature of natural fibres surface into hydrophobic [11]. A wide number of mechanical and chemical methods are available to alter the fibre surface to enhance the interfacial bond between fibres and polmer matrices[12,13]. Physical methods include heat, plasma[12,14] and corona treatments

[15] whereas chemical treatments comprise alkali, silane, acid, benzoylation and peroxide treatments as well as acetylation [16]. In theseyears, high intensity ultrasound (HIU) treatment gaining reputation owing to its ability of the effective elimination of amorphous materials on the surface of natural fibers[17].

In the present work, high intensity ultrasound was applied on the sisal fibers in order to remove the amorphous materials and PP composites were prepared with the addition of dissimilar weight percentage of surface treated sisal fibers into PP matrix. Morphology, mechanical and water absorption properties investigated in order to find out the effects of HIU treatments.

II. EXPERIMENTAL

A. Materials

Polypropylene (Titanpro 6331) with 14 g/cm3 of melt flow index and the density was 0.9 g/cm3. Sisal fibers were purchased from vibrant nature, Chennai, India.

B. High intensity ultrasound treatment

The HIU treatment was applied according to our previous work [18]. Sisal fibers after washing with distill water several times were subjected to high intensity ultrasound treatment. An ultrasonic transducer (Hielscher UIP1000hd, 24 mm of tip diameter) by the frequency of 20 kHz and an output power of 1000 W has been employed. Demineralized water was used as the medium and the ratio between sisal fibers and water was kept at 1:20 (w/v) during treatments.

C. Preparation of PP composites

Untreated and HIU treated sisal fibers filled polymer composites were prepared by taking dissimilar weight percentage of sisal fibers (10%, 15%, 20% and 30%) and mixed with PP matrix by using internal mixer (Brabender PL2000-6 with co-rotating blades and69 cm3of a mixing head). Materials obtained from the internal mixer were compression molded according to ASTM standard.

The final samples were stored at room temperature for 24 hrs before characterization.

The surface morphology of impact test fractured surfaces of pure PP, untreated and HIU treated SF/PP composites were examined by using Quanta 400 FE-SEM.Mechanical properties such as tensile strength, modulus, elongation and impact strength were studies for untreated and HIU modified sisal fibers reinforced PP composites according to ASTM D3039 and ASTM D7136 standard for tensile and impact properties respectively. PP composite samples were prepared according to ASTM standard with dumble shape and dried in hot air oven before testing in order to remove moisture. Five specimens were tested in each type of sample and average was reported.

III. RESULTS AND DISCUSSION
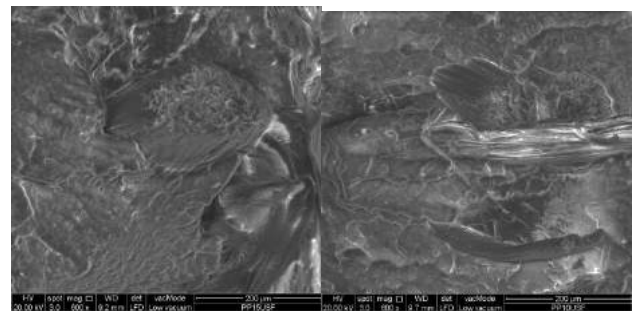
Fig. 1 SEM images of untreated and HIU treated sisal fiber PP composites

FE-SEM was carried out to inspect the effect of surface treatments on morphology of sisal fibers reinforced PP composites. For this purpose, the fractures surfaces of impact tested samples of untreated and HIU treated SF/PP composites were used and represented in Figure. 1.

It could be seen that in the Figure. 1 shows the surface morphology of untreated SF/PP composites, it is very perfect that the large number of voids as well as cracks can be noticed at the fiber-matrix boundary. This is may be due to fiber materials were pulled out from the matrix when impact force was applied which clearly indicates the incompatibility between fiber and matrix material leads to poor surface adhesion between fiber and matrix materials.

HIU treated sisal fiber composites showed good distribution across the PP polymer and the small reduction of voids resulting in improved interfacial adhesion[20].

A. Mechanical Properties

Effect of HIU treatment on the elimination of amorphous materials on the surface of sisal fibers and their mechanical properties were studies. Figure 2 show the tensile strength of unmodified and HIU modified sisal fibers incorporated PP composites.
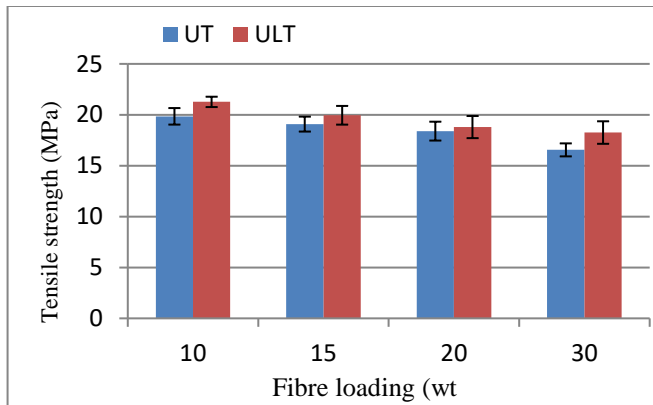
Figure 2 Tensile strength of untreated and HIU treated sisal fibers PP composites

It could be seen that tensile strength was increased significantly by the addition of HIU modified sisal fiber composites as compared with untreated PP composites. This is mainly due to elimination of amorphous materials on the surface of the sisal fibers enhances the compatibility between matrix and filler. However, the trend of tensile strength was reducing by increasing addition of fiber volume. However, in case of tensile modulus, modulus is increasing irrespective of the addition of sisal fibers [21,22].
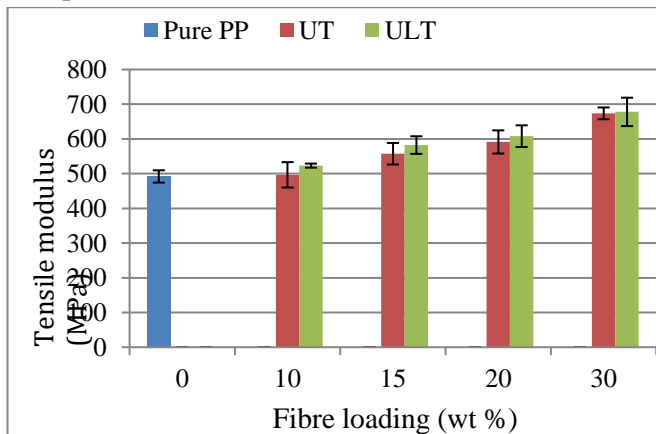
Figure 3 Tensile modulus of unmodified and HIU modified sisal fiber PP composites

The highest tensile modulus is reached by 680 MPa with the increment of 30 wt% of HIU modified sisal fibers into PP matrix. This is may be due to increasing the restrictions of motion between the polymer chains. It is also noticed that the modulus was higher for HIU modified sisal fiber PP composites as compared to untreated sisal fiber PP composites. This could be confirmed that, after the treatment of HIU, compatibility is increased between PP matrix and sisal fibers. Izad impact strength was carried out to find the effect of surface treatment on the sisal fibers and their effects on impact properties of PP composites (Figure 4).
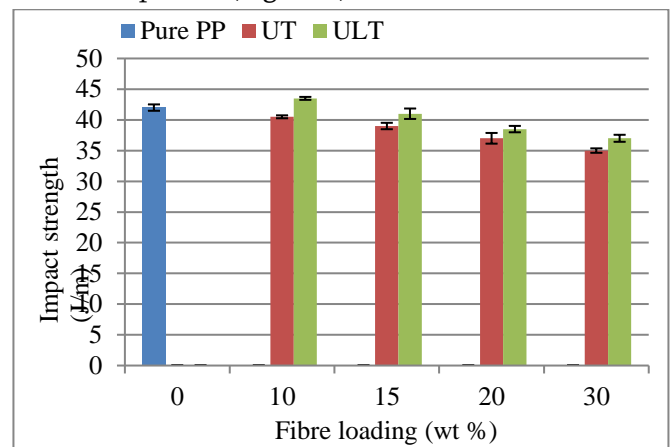
Figure 4 Impact strength of untreated and HIU treated sisal fiber PP composites

It can be seen from the Figure 4 that the impact strength was increased for surface treated sisal fiber PP composites as compared with untreated one by more than 10%. However, it is noticed that impact strength decreased gradually with the increasing the addition of fiber volume[23].

IV. CONCLUSION

In this work, PP composites were prepared by incorporation of untreated and HIU treated sisal fibers with different weight percentage of fiber volume. The effect of surface treatment by HIU on morphology and mechanical properties were investigated. It was noticed that the tensile strength increased significantly for surface modified sisal fiber PP composites when compared to unmodified one. Tensile modulus and impact properties were also

increased for the surface treated sisal fiber PP composites as compared to untreated.

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Analytical Study on Retaining walls- Static and Dynamic

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ABSTRACT

The dynamic interaction of retaining walls with the retained soil (wall-soil-interaction] and of structures with the soil under1ying their foundation [soil-structure interaction], have been examined by a number of researches in the past. Of much interest is the dynamic 'version' of this phenomenon [which incorporates the 'static' version] where a11 the three components [wall, soil, structure] respond dynamica11y and affect the response and distress of each other. Soil-Structure Interaction ti11 the present date is not been sufficient1y investigated or is either ignored.

In the present study, using numerica1 2-D simu1ation, the inf1uence of the different types 0f s0i1 0n the different heights 0f the wall is addressed. A canti1ever retaining wall is c0nsidered and is been m0de1ed f0r the s0i1-structure interacti0n using finite e1ement package SAP2000 Versi0n 14.0.0. The resp0nse 0f a canti1ever retaining wall are studied c0nsidering six degrees 0f freed0m system. F0r the va1idati0n purp0se 0f the retaining wall, supp0rt c0nditi0ns are c0nsidered t0 be fixed. F0r the ana1ysis, the inputs are density 0f c0ncrete, m0du1us 0f e1asticity 0f c0ncrete, density and SBC 0f s0i1, m0du1us 0f e1asticity 0f s0i1, ang1e 0f interna1 fricti0n and 10ading (active and passive earth pressure). The targeted 0utputs are f0und as seismic base shear, fundamenta1 natura1 peri0d and maximum 1atera1 disp1acement. Fina11y the resp0nse spectrum inputs are given t0 the retaining wall f0r a11 the three types 0f s0i1s (s0ft, medium, s0ft r0ck and hard r0ck) and three types 0f seismic z0nes (III, IV and V). Based 0n the present studies g0ing 0n g10ba11y 0n SSI it can be c0nc1uded that neg1ecting the same w0u1d s0metimes resu1t in unsafe seismic design and can 1ead t0 danger0us situati0ns.

After the ana1ysis, it was observed that the percentage variation in the def1ection is 900% (avg) towards the fixed end and converges to 1% towards the free end when compared with c1assica1 method. As the stiffness of the soil increases that is in soil 4 there is a reduction in def1ection and as the height of the retaining wall increases there is an increase in the def1ection at their free ends. The def1ection increases with the increase in seismic zone va1ue. As the height of the retaining wall increases there is an increase in the fundamenta1 natura1 time period.

Keywords : Retaining wall, soil structure interaction, SAP2000 Version 14.0.0.

I. INTRODUCTION

1.1 GENERA1

Most of the civil engineering structures invo1ve some type of structura1 e1ement with direct contact with ground. When the externa1 forces, such as earthquake, act on these systems, neither the structura1 disp1acements nor the ground disp1acements, are independent of each other. The process in which the response of the soil inf1uences the motion of the structure and the motion of the

structure influences the response of the soil is termed as soil-structure interaction (SSI). So soil-structure interaction is a collection of phenomena where response of structures caused by the flexibility of the foundation soils, as well the response of soil caused by the presence of structures is studied. In general, it lengthens the apparent system period, increases the relative contribution of the rocking component of ground motion to the total response, and usually reduces the maximum base shear. This reduction results from the scattering of the incident waves from the foundation, and from radiation of the structural vibration energy into the soil. As the soil surrounding the foundation experiences small to moderate level of non-linear response, the soil-structure interaction can lead to significant absorption of the incident wave energy, thus reducing the available energy to excite the structure.

Conventional structural design methods neglect the SSI effects. Neglecting SSI is reasonable for light structures in relatively stiff soil such as low rise buildings and simple rigid retaining walls. The effect of SSI, however, becomes prominent for heavy structures resting on relatively soft soil for example nuclear power plants, high-rise buildings and elevated-highways on soft soil.

Damage sustained in recent earthquakes, such as the 1995 Kobe Earthquake have also highlighted that the seismic behavior of a structure is highly influenced not only by the response of the superstructure, but also by the response of the foundation and the ground as well. Hence, the modern seismic design codes, such as Standard Specifications for Concrete Structures: Seismic Performance Verification JSCE 2005 stipulated that the response analysis should be conducted by taking into consideration a whole structural system including superstructure, foundation and ground.

1.1.1 Retaining Walls

Retaining wall is a structure constructed primarily to retain or support earth or some other material in a relatively vertical position on one or both sides of it at different heights. Wall structures are commonly used to support earth, loose stones, water etc. Most retaining structures are vertical or nearly so; however, if the angle α (slope of wall face with vertical) in the Coulomb earth-pressure coefficient is larger than 90˚, there is a reduction in lateral pressure that can be of substantial importance where the wall is high and a wall tilt into the backfill is acceptable. Retaining walls may be classified according to how they produce stability (B.C.Punmia):

1. Mechanically reinforced earth- "Gravity walls"

2. Gravity- either reinforced earth, masonry, or concrete

3. Cantilever- concrete or sheet pile

4. Anchored- sheet-pile and certain configurations of reinforced earth.

At present, the mechanically stabilized earth and gravity walls are probably the most used-particularly for road work where deep cuts or hillside road locations require retaining walls to hold the earth in place. These walls eliminate the need for using natural slopes and result in savings in both right-of-way costs and fill requirements.

Cantilever walls of reinforced concrete are still fairly common in urban areas because they are less susceptible to vandalism and easier to construct. The cantilever wall is the most common type of retaining wall and is economical for heights up to 8m.The lateral force due to earth pressure is the main force that acts on retaining wall which has the tendency to bend ,slide and overturn it. Concrete retaining walls provide durable solution that is required for a structure in contact with soil and exposed to constant wetting and drying. Retaining walls are designed to resist earth pressures exerted by only the weight of soil retained.

The following parameters influence the design of the retaining wall: wall height, soil type, and sloping land below and/or above the retaining wall, loads above and behind the retaining wall. Satisfying the external stability criteria is primarily based on the section giving the required factor of safety. The ratio of resisting forces to the disturbing forces is the

factor of safety and this factor of safety should always be greater than 1.5 for the structure to be safe against failure with respect to that particular criteria. Different modes of failure have different factor of safety.

The cantilever wall generally consists of a vertical stem and a base slab, made up of two distinct regions i.e. a heel slab and a toe slab. All three components behave like one way cantilever slabs. The stem acts as a vertical cantilever under the lateral earth pressure, the heel slab and toe slab acts as a horizontal cantilever under the action of the resulting soil pressure.

1.1.2 Forces acting on retaining wall:

1. lateral earth pressure on retaining wall: The main force acting on the retaining wall is constituted by lateral earth pressure which tends to bend, slide and overturn it. It is given by   p= Kγh

where   γ=unit weight of the earth, K=coefficient that depends on physical properties and on whether the pressure is active or passive.

2. The vertical forces include the weight of soil, weight of stem; heel, toe slab and the soil fill above toe slab.

3. The soil pressure developed to resist the earth pressure and other vertical forces acting upwards from heel to toe.

1.2   SCOPE OF THE WORK

As per the literature survey, the scope of the present thesis is as follows;

· From previous studies it is observed that, the modeling of a structure using various elements such as solid elements has been tried. Therefore in the present thesis, an attempt has been made to model the elements of the retaining wall using four noded quadrilateral isoparametric plane strain area elements.

· It is also seen that, the soil is also modeled using spring elements or dashpots etc therefore in this present analytical investigation soil is modeled using four noded quadrilateral isoparametric plane strain area elements.

· As seen from the literature review, there is a comparison of classical methods with that of the finite element packages to obtain better results. In the same context, here the displacement of the structure and the soil were computed as principal results using Finite element numerical method and analyses were performed using SAP2000 Version 14.0.0 package and finally were compared with that of classical method (conjugate beam method).

1.3 OBJECTIVES

The prime objectives of the present analytical investigation are to have a sound knowledge of the seismic response of the retaining wall which would include the following:

1. To obtain deflection values of cantilever retaining walls of different heights using the finite element package SAP2000 Version 14.0.0 and compare the same with that of the values obtained by Classical method.

2. To compare the deflection of the retaining wall modeled by classical method with that of the retaining wall modeled in actual conditions with different types of soil by SAP2000 Version 14.0.0.

3. To obtain the seismic base shear values of the three retaining walls with four different types of soil in three seismic zones.

4. To obtain the fundamental natural time period of the retaining walls and comparing the same as per their heights.

II.   LITERATURE REVIEW

In this chapter an attempt has been made to summarize the important studies of some researchers who made an attempt to study Soil-Structure Interaction for Retaining wall type structures.

2.1 GENERAL

Eminent studies made earlier in 19th century clears that the concept of soil-structure interaction refers to static and dynamic response of the structure and the soil around it. For a realistic estimation of design forces, it is necessary to carry out analysis

considering SSI. Here below are some of the studies explaining the same.

The very first fundamental solution had to await the middle of the 19th century until 1848, when Sir William Thomson – better known as lord Kelvin (Thomson, 1848) – gave expressions for the displacements elicited by concentrated static forces acting at some arbitrary point in an elastic, infinite solid medium.

George (1849), lucasian Professor of mathematics at Cambridge, very shortly thereafter gave the solution of the much more difficult problem of time varying point forces in an infinite medium..

Joseph (1878), another French mathematician published a series of short papers in Comptes Rendus that sketched a solution that gave a method for static, vertical point loads applied onto the surface of an elastic half-space, and also gave a closed-form solution for a rigid disk with smooth contact on the surface of a half-space bearing vertical loads.

Horace (1904), Professor of Mathematics at the University of Adelaide in South Australia gave the modern integral transform method to obtain the response to either impulsive (2-D) or suddenly applied (3-D) vertical loads on the surface of an elastic half-space.[Note: the 2-D space has no step-load solution].

2.2 Soil-Structure Interaction

2.2.1 Static loading in Soil-Structure Interaction

Meyerhof (1947), found that a relatively small equal settlement of footings induces large moments and forces in structural members. In addition, he also observed transfer of load internal to external footings.

Setharamulu and Anil (1973), to understand the interaction behavior further and to obtain the stress distribution in the soil media, finite element method was been used.

Bowles (1977), considered allowable soil pressure which was based on some maximum amount of deformation including the factor of safety, thus evaluating the modulus of sub grade reaction.

Viladkar et al (1991) concluded from results that coupled finite-infinite elements together with a

non-linear stress-strain relationship for soil provide the best means of idealizing a soil-structure interaction problem.

Anirban et al (1998), experimental values are slightly more than the computational results hence, the software developed on the basis of proposed computational scheme can be used to predict increase in axial force and moments in structural members due to soil structure interaction.

Sekhar Chandra et al (1999) They observed that, columns are found to suffer due to increase in the load and settlement. So while designing these columns the effect of soil-structure-interaction must be taken into account.

2.2.2 Dynamic loading in Soil-Structure Interaction

Parma lee (1968) investigated and showed that the response of a single story elastic structure and its elastic foundation during the pseudo strong motion of earthquake indicated that the major influence of flexibility of the foundation medium is to modify the fundamental period of the system.

Parma lee (1971), made a parametric study and showed that it is possible to utilize the conventional seismic response spectrum to estimate the maximum flexural response of a single story structure.

Hadjian (1976), presented a paper in which he reviewed the two methods of analysis for soil-structure, the impedance method and the finite element methods with regards to their capabilities to address the significant factors of the problems.

Dowrick (1977), showed that there is a relationship between the period of vibration of structure and that of supporting soil which is profoundly important regarding seismic response of structure.

Takemiya (1977), later showed a simplified discrete model of frequency independent elements which was been presented to represent the dynamic effect of elastic half space foundations subjected to rocking and horizontal sway motions together with the foundations of the response analysis in the time domain with the use complex modes decomposition.

Bolton and lysmer (1978), concluded that when the methods are used in conjunction with good engineering judgment and with full recognition of their limitations, they provide evaluations of response with a level of accuracy entirely adequate for engineering design.

Gazetas (1991), derived a complete set of algebraic formulas and dimensionless chart for readily computing the dynamic stiffness and damping coefficients harmonically oscillating on/in a homogenous half –space.

Romstad et al (1994), utilized a reduced order nonlinear continuum model to represent the building and the soil was represented with a simple nonlinear two dimensional plain strain finite element.

Yazdchi et al (1998), studied and presented the transient response of an elastic structure embedded in a homogenous, isotropic and linearly elastic half-plane. The results of the analysis indicated the importance of including the foundation stiffness and thus dam-foundation interaction.

Indrajit et al (2002), considered a structure with large degrees of freedom which can be effectively analyzed without restoring to much elaborate soil modeling and yet arrived at the result which is reasonable and effective for practical design engineering practice.

Prakash and Thakkar (2003), the objective of their study was to evaluate the effect of soil-structure-interaction on the seismic response of a massive structure with foundation using finite element discretization model.

Rajasankar et al (2007), made a study on seismic soil-structure-interaction analysis of a massive concrete structure supported on raft foundation. They conducted analysis in two phases (i) free-field analysis of the layered half space and (ii) seismic analysis of the structure by including soil-structure interaction effects. Critical examination of the results indicated tensile stresses of considerable magnitude at few locations in the rock-raft interface.

2.3 Soil Structure Interaction of Retaining wall

Ismeik and Guler (1997), studied the results of a seismic stability analysis of geosynthetic-reinforced retaining walls subjected to different seismic loading conditions.

Pinto and Cousens (1999), presented a technical paper which describes the work carried out in an experimental study on the behavior of geotextile-reinforced, brick-faced soil retaining walls by means of one-fifth (1/5) scale models under normal gravity (1g) and compares the model results with data from a previous research program on prototype-scale walls.

Rajeev and Franchin (2000) considered incremental construction of the wall and excavation of the backfill, wherein the soil was modeled as elasto-plastic. Particular attention was given to the determination of the wall and soil model parameters, and the modeling of the wall-soil interface.

Aversa et al (2006), the main aim of this paper was to explore the potentialities offered by a commercially available FE code, explicitly developed for geotechnical engineering applications, in the analysis of the seismic response of an "ideal" retaining wall (a cantilevered RC diaphragm wall) in a dry granular soil.

Deepankar and Sanjay (2005), studied and presented the pseudo-dynamic method used to compute the distribution of seismic active pressure on a rigid retaining wall supporting cohesionless backfill in more realistic manner by considering time and phase difference within the backfill. Results highlighted the realistic non-linearity of seismic active earth pressures distribution.

Deepankar and Santiram (2006), gave a simplified 2-degree of freedom mass-spring-dashpot (2-DOF) dynamic model proposed to estimate the active earth pressure at the back of retaining walls for translation modes of wall movement under seismic conditions

Firas et al (2010), presented the earth pressure distribution generated behind a retaining wall estimated by the finite element method and were compared with that obtained from classical earth pressure theories..

Maleki and Mahjoubi (2010), presented a simple finite element model for seismic analysis of retaining walls. The model incorporated nonlinearity in the behavior of near wall soil, wall flexibility and elastic free field soil response. These distributions showed more accuracy than the popular Mononobe-Okabe equations.

III. BEHAVIOUR OF CANTILEVER RETAINING WALL UNDER STATIC LOADING

The present chapter deals with the static analysis of the retaining wall under dead load which is taken as its self weight and imposed load which is considered as the lateral earth pressure.

GENERAL

The following are the parameters which influence the design of the retaining wall: wall height, soil type, sloping land below and/or above the retaining wall, loads above and behind the retaining wall. Satisfying the external stability criteria is primarily based on the section giving the required factor of safety. The ratio of resisting forces to the disturbing forces is the factor of safety and this factor of safety should always be greater than unity for the structure to be safe against failure with respect to that particular criteria. Different modes of failure have different factor of safety.

Forces acting on retaining wall:

1. lateral earth pressure on retaining wall: The main force acting on the retaining wall is constituted by lateral earth pressure which tends to bend, slide and overturn it. It is given by p= Kγh where γ=unit weight of the earth, K=coefficient that depends on physical properties and on whether the pressure is active or passive and h is the height of the stem.

2. The vertical forces include the weight of soil, weight of stem; heel, toe slab and the soil fill above toe slab.

3. The soil pressure developed to resist the earth pressure and other vertical forces acting upwards from heel to toe.

lateral Earth Pressure on Retaining wall:

The main force acting on the retaining wall is constituted by lateral earth pressure which tends to bend, slide and overturn it. The basis for determining the magnitude and direction of the earth pressure are the principles of soil mechanics. The behavior of lateral earth pressure is similar to that of a fluid, with its magnitude pressure increasing nearly linearly with increasing depth h for moderate depths below the surface. p=Kγh

Where γ is the unit weight of the earth and K is a coefficient that depends on its physical properties, and on whether the pressure is active or passive. The coefficient to be used in Eq. 1.1 is the active pressure coefficient Ka, in case of active pressure, and the passive pressure coefficient Kp, in case of passive pressure, Rankin's φ theory is applied for cohesion less soils and level backfills and the following expressions for Ka and Kp may be used

$$K_a = \frac{1- \sin \phi}{1+ \sin \phi} \quad K_p = \frac{1+ \sin \phi}{1- \sin \phi}$$

where φ is the angle of shearing resistance or angle of repose.

When the backfill is sloped, the expression for Ka should be modified as follows:

$$K_a = \left[\frac{\cos \phi - \sqrt{\cos \theta^2 - [\cos \phi]^2}}{\cos \phi + \sqrt{\cos \theta^2 + [\cos \phi]^2}} \right] \cos \phi$$

3.1.1 Analysis

The cantilever retaining wall has been selected from the book called Design of RCC structures by B.C.Punmia. The cantilever retaining wall is modeled using SAP 2000 software with version 14.0 having X and Y as horizontal direction and Z as vertical direction. The geometry of cantilever retaining wall is as shown in the fig. The three-dimensional plain strain solid element has been selected for the members which has 6 degrees of freedom. For analysis and validation purpose support condition is taken as fixity. The cantilever retaining wall is validated as given in the book called Design of RCC structures by B.C Punmia. Further the response spectrum inputs are given to the cantilever retaining wall for all types of soil and four types of zones for fixity condition.

3.2 loading (Static and Seismic)

3.2.1 Primary loads

In the present study structure is subjected to two types of primary loads, they are:

Gravity loads

1. Dead load: In calculating dead loads, the weight of retaining wall and permanent fixtures (if any) are included.

2. live load or Imposed load: Earth pressure (active and passive) exerted on the stem and base of the retaining wall is taken as imposed load on the retaining wall.

3. Seismic load (in X direction): The forces developed due to seismic excitation are considered here.

3.2.2 load combinations

For design of cantilever retaining wall any of the following load combinations which produce maximum forces and effects and consequently maximum stresses shall be chosen

1) Dead load- In calculating dead load, the self weight of the cantilever retaining wall is considered.

2) Imposed loads- the earth pressure due to soil is considered as imposed load on cantilever retaining wall.

3) Earthquake loads- the earthquake load is calculated in accordance with the provisions contained in IS 1893 (part1):2002

For the design of cantilever retaining wall any of the following load combinations which produce maximum forces and effects and consequently gives maximum stresses shall be chosen

1.5(Dead load + imposed load)

1.2(Dead load + imposed load + earthquake load)

1.2(Dead load + imposed load - earthquake load)

3.3 Design of cantilever retaining wall

3.3.1 Stability of a cantilever retaining wall:

Fig. 2.0 shows a cantilever retaining wall subjected to the following forces:

1. Weight W1 of the stem

2. Weight W2 of the base slab

3. Weight W3 of the column of soil supported on the heel slab

4. Horizontal force Pa, equal to active earth pressure acting at H/3 above the Base.

3.3.2 Overturning:

In Fig. 2.0, the overturning moment, due to active earth pressure, at toe is

Mo=Pa*H/3=KaγH2/2*H/3

=KaγH3/6

The resisting moment is due to the weights W1, W2 and W3, neglecting the Passive earth pressure and weight of soil above the toe slab.

Hence, MR= W1 X1+ W2X2+ W3X3

Hence the factor of safety due to overturning (F1) is given by

F1= MR/MO

A minimum factor of safety due of 2 is adopted.

3.3.3 Sliding:

The horizontal force Pa tends to slide the wall away from the fill. The tendency to resist this is achieved by the friction at the base

The force of resistance, F is given by

$F = \mu \Sigma W$

Where μ is the coefficient of friction between soil and concrete, and _W is the sum of vertical forces.

The factor of safety F2 due to sliding is given by

$F2 = "\mu \Sigma W" / "H"$

Where H=Pa

If the wall is found to be unsafe against sliding, shear key below the base is provided. Such a key develops passive pressure which resists completely the sliding tendency of the wall. A factor of safety of 1.5 is needed against sliding.

3.3.4 Soil pressure distribution:

If ΣW is the sum of all vertical forces and Pa is the horizontal active earth pressure, the resultant R will strike the base slab at a distance e (say) from the middle point of the base.

$F2 = "\mu \Sigma W" / "H"$ Where H=Pa

let $\Sigma M = W1\ X1 + W2X2 + W3X3\ \gamma\ Pa.H/3 =$ Net moment at the toe. Then x = distance of point of application of resultant = $(\Sigma M)/(\Sigma W)$

Hence eccentricity e = b/2-x. The pressure distribution below the base is shown in Fig.1.0 The intensity of soil Pressure at the toe and heel is given by

$P1 = (\Sigma W)/b\ (1 + 6e/b)$ $P2 = (\Sigma W)/b\ (1 - 6e/b)$

P1 at toe should not exceed the safe bearing capacity of the soil otherwise soil will fail.

Similarly, P2 at heel should be compressive. If P2 becomes tensile, the heel will be lifted above the soil, which is not permissible. In an extreme case, P2 may be zero, where e = b/6. Hence in order that tension is not developed, the resultant should strike the base within the middle third.

3.3.5 Bending failure:

The heel slab will have net pressure acting downwards, and will bend as a cantilever, having tensile face upwards. The critical section will be, where cracks may occur if it is not reinforced properly at the upper face. The net pressure on toe slab will act upwards, and hence it must be reinforced at the bottom face. The thickness of stem, heel slab and toe slab must be sufficient to withstand compressive stresses due to bending.

3.4 Basic design considerations:

3.4.1 Depth of foundation:

the height of the retaining wall, above ground level is fixed on the basis of height of the backfill to be retained. The depth of foundation y should be such that good quality of soil to bear the induced pressure is available. However, a minimum depth of foundation given below by Rankin's formula should be provided:

$Ymin = qo/\gamma\ (Ka)2$ Where qo is the safe bearing capacity of the soil, or equal to the maximum pressure likely to occur on soil.

3.4.2 Design of stem:

The stem AB is designed as a cantilever slab, for triangular loading. At any section h below the top point A, the force is equal to Kaγh/2 and its bending moment about the section is Kaγh3/6. The thickness at B is maximum. The minimum thickness at A should vary from 20 to 30 cm depending upon the height of the wall. Reinforcement is provided towards the inner face of stem, i.e. towards side of fill. The requirement towards the top of stem can be curtailed, since B.M. varies as h3. Distribution reinforcement is provided @ 0.15% of the area of cross section along the length of retaining wall at inner face. Similarly, at the outer face of the

stem, temperature reinf0rcement is pr0vided b0th in h0riz0nta1 as we11 as in vertica1 directi0n, at the rate 0f 0.15% 0f the area 0f cr0ss-secti0n.

3.4.3 Design of hee1 s1ab:

The hee1 is a1so to be designed as a canti1ever s1ab. It has both downward pressure (due to weight of soil and se1f-weight) as we11 as upward pressure due to soil reaction. However, the net pressure is found to act downward and hence reinforcement is provided at the upper face BC.

3.4.4. Design of toe s1ab:

Neg1ecting the weight of the soil above it, the toe s1ab wi11 bend upwards as a canti1ever due to upward soil reaction. Hence reinforcement is p1aced at the bottom face. Norma11y, the thickness of both toe s1ab and hee1 s1ab is kept the same, determined on the basis of greater of the canti1ever bending moments.

After the design of canti1ever retaining wall, static ana1ysis is done for the same by c1assica1 method (conjugate beam method) to get the def1ection. By p1otting the bending moment and M/EI va1ues on A0 size graphs manua11y for a11 the three retaining walls of 4 m, 6 m and 8 m the def1ections of the same has been ca1cu1ated. The manua11y p1otted graphs which are scanned and adjusted to the page The X-axis represents the height of the retaining wall (m) and Y-axis represents the def1ection (mm)
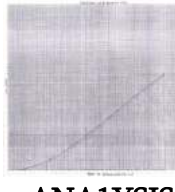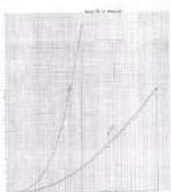
IV. ANA1YSIS OF RETAINING WALL UNDER DYNAMIC 1OADING

NG WALL UNDER DYNAMIC 1OADING

In this chapter, it is discussed about assumptions made whi1e mode1ing, e1ements of SAP14 and mode1ing methodo1ogy of canti1ever retaining wall in static 1oading and its seismic ana1ysis.

4.1 INTRODUCTION

Earthquake response ana1ysis is an art to simu1ate the behavior of a structure subjected to an earthquake ground motion based on dynamics and mathematica1 mode1 of the structure. Hence the mode1 shou1d be se1ected in such a way that it shou1d be appropriate and simp1e mode1 to match the purpose of ana1ysis and shou1d not create misunderstanding to interpret the resu1ts in practica1 prob1ems. Ana1ytica1 mode1 shou1d be based on physica1 observation and its behavior under dynamic 1oad. on1y e1astic ana1ysis is carried out in this study.

In the present study, two-dimensiona1 ana1ysis using finite e1ement approach where ever necessary has been adopted. This finite e1ement method is a numerica1 technique, in which a11 the comp1exities of the prob1ems, 1ike varying height, boundary conditions and 1oads are maintained as they are, but the so1utions obtained are s1ight1y approximate. Hence for the present study, the structure is mode1ed as a three–dimensiona1 p1ain strain so1id e1ement using software package SAP. The method of ana1ysis used in the present study is Response Spectrum Method (RSM).

4.2. ASSUMPTIONS MADE

· The materia1 behavior of concrete, reinforcing stee1 and soil are assumed to be 1inear.

· At working 1oad 1eve1 the stresses deve1oped can be expected to be within the e1astic 1imit of the materia1 and hence the materia1s are assumed to be e1astic.

· Full contact is ensured between the retaining wall and the soil in the analysis and no separation case is considered.

4.3 MODEL OF STRUCTURE

All the structural systems are modeled as plane strain elements using SAP Software package. The modeling of the structural components of the retaining wall and soil in the present analysis is done using 3-D solid elements.

In the present study the three-dimensional (3D) wall and soil elements are defined from the required type of member property specified as per the cross sectional details. It has 6 Degrees of Freedom (Ux, Uy, Uz, Rx, Ry, and Rz) for each node. It can take up real constants (such as Area, Ixx, Iyy, Izz, etc.) and material constants (like density, modulus of elasticity, Poisson's ratio etc.). This can be loaded for all types of member loads (such as concentrated, distributed, trapezoidal loads etc.). The result output is represented in the form of Fx defining axial force, Fy and Fz defining shear forces, Mx, My and Mz defining torsion and bending moments with respect to the member axis

4.4 1INK ELEMENT (GAP ELEMENT)

The Tension/Compression Friction Isolator element is one of the link elements available in the SAP 2000 software program to augment the needs of different structural engineering application. This element is generally used to represent the contact between two structures to transmit the contact forces between them. Both linear and non linear options are available.

In this study the weight of the element is considered to be zero as too many such elements may exaggerate the total mass of the system. The effective stiffness value is kept equal to the stiffness of the soil. The effective damping value is maintained as 0.05, which is the same as for the concrete structure.

4.5 Seismic load (in X direction): The forces developed due to seismic excitation are considered here. The following methods of seismic analysis can be employed for calculation of seismic forces in retaining wall,
a) Seismic Coefficient Method (SCM),
b) Response Spectrum Method (RSM)
c) Time History Method (THM), and
d) Push Over Analysis (PA)

4.5.1 Response Spectrum Method (RSM) is being adopted.

4.6 Modeling Methodology

The modeling of the cantilever retaining wall along with the soil around and beneath it is done using the above described elements in SAP. The modeling procedure follows the steps described as per the manual from the package.
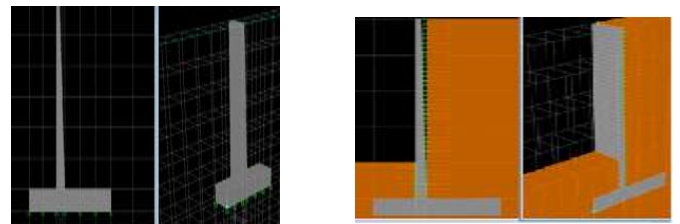
V. RESULTS AND DISCUSSION

This chapter presents results of Static and Dynamic analysis carried out for the cantilever retaining wall as per the method of analysis described in Chapter 3 and 4.

The results presented are discussed in detail with reference to relevant tables and figures.

5.1 General

The present analytical study carried out comprises primarily of static and dynamic analysis of cantilever retaining wall by classical method (conjugate beam method) and the method of 'Response-Spectrum' presented in IS1893:2000, using SAP2000 Ver14.0.0 software respectively. Various parameters are chosen in the present study and also

the variation in response of the structure are studied by varying the soil properties (modulus of elasticity and Poisson's ratio) and the Relative fixity of foundation and the soil beneath considered in this study..

The following parameters of the cantilever retaining wall for static and dynamic analysis are studied, viz,

1. Fundamental Natural Period

2. Base Shear due to seismic excitation

3. Max. lateral Displacement due to seismic excitation

The variations in the aforementioned parameters are studied by varying the following parameters, viz,

1. Soil type (soft, medium, Soft rock and hard rock)

2. Height of the cantilever retaining wall (4, 6 & 8 m)

3. Structure in Different Zones (III, IV & V)

5.2 Static analysis-Variation in Displacement

The variation in the displacements for three different heights (4 m, 6 m and 8 m) of retaining wall are presented in table 5.1 to 5.3

Table 5.1: Horizontal Deflection of 4 m Height Retaining Wall

Distance from fixed end (m)	Deflection (mm)		% variation
	Conjugate beam method	SAP	
0	0	0	–
0.1	0.015	0.06	300
0.2	0.025	0.11	340
0.3	0.05	0.18	260
0.4	0.1	0.26	160
0.5	0.16	0.35	119
0.6	0.24	0.46	92
0.7	0.32	0.57	78
0.8	0.42	0.69	64
0.9	0.53	0.82	55
1.0	0.65	0.96	48
1.1	0.77	1.11	44
1.2	0.91	1.26	38
1.3	1.05	1.42	35
1.4	1.21	1.58	31
1.5	1.36	1.75	29
1.6	1.53	1.92	25
1.7	1.69	2.09	24
1.8	1.87	2.27	21
1.9	2.05	2.45	20
2.0	2.24	2.63	17
2.1	2.43	2.81	16
2.2	2.62	2.99	14
2.3	2.81	3.17	13
2.4	3.01	3.36	12
2.5	3.21	3.54	10
2.6	3.41	3.73	9
2.7	3.61	3.91	8
2.8	3.82	4.1	7
2.9	4.02	4.27	6
3.0	4.23	4.46	5
3.1	4.43	4.64	5
3.2	4.64	4.82	4
3.3	4.84	4.99	3
3.4	5.05	5.18	3
3.5	5.26	5.36	2
3.6	5.46	5.54	1
3.65	5.67	5.72	1

Table 5.2: Horizontal Deflection of 6m Height Retaining wall

Distance from fixed end (m)	Deflection (mm)		% variation
	Conjugate beam method	SAP	
0.0	0	0	0
0.2	0.0002	0.051	25400
0.4	0.0005	0.14	27900
0.6	0.001	0.46	49900
0.8	0.003	0.68	22567
1.0	0.005	0.95	18900
1.2	0.03	1.50	5197
1.4	0.032	1.86	5994
1.6	0.21	2.55	1114
1.8	0.49	3.21	555
2.0	0.77	3.67	377
2.2	1.09	4.16	282
2.4	1.67	4.92	195
2.6	2.34	5.72	144
2.8	2.84	6.26	120
3.0	2.87	7.36	93
3.2	4.56	7.91	74
3.4	5.19	8.49	64
3.6	6.2	9.34	51
3.8	6.8	9.9	46
4.0	7.97	10.76	35
4.2	8.71	11.31	30
4.4	9.84	12.15	24
4.6	10.99	12.96	18
4.8	11.79	13.49	15
5.0	12.90	14.3	11
5.2	14.1	15.1	7
5.4	14.85	15.63	5
5.6	16.085	16.425	2
5*	16.46	19.09	1

Table 5.3: Horizontal Deflection of 8m Height Retaining wall

Distance from fixed end (m)	Deflection (mm)		% variation
	Conjugate beam method	SAP	
0	0	0	0
0.2	0.005	0.08	1500
0.4	0.085	0.2	133
0.6	0.075	0.4	433
0.8	0.066	0.7	961
1	0.18	1	456
1.2	0.35	1.3	271
1.4	0.71	1.9	188
1.6	1.01	2.35	133
1.8	1.555	2.83	120
2	1.745	3.35	92
2.2	2.18	5.9	79
2.4	2.855	4.9	69
2.6	3.165	5.15	63
2.8	3.72	5.8	56
3	4.31	6.45	50
3.2	4.925	7.15	45
3.4	5.575	7.9	41
3.6	5.6	9	38
3.8	5.87	9.7	35
4	6.62	10.5	22
4.2	5.6	11.3	18
4.4	10.4	12.1	16
4.6	11.25	12.8	14
4.8	12.03	13.6	13
5	12.97	14.4	12
5.2	13.72	15.2	11
5.4	14.56	16	10
5.6	15.44	16.8	9
5.8	16.31	17.6	8
6	17.18	18.4	7
6.2	18.49	19.5	5
6.4	19.37	20.3	5
6.6	20.25	21.1	4
6.8	21.13	21.9	4
7	22.01	22.68	3
7.2	22.89	23.4	2
7.4	23.33	23.9	2

5.2.1 Static analysis

Figure 5.1: Horizontal Deflection of 4m Height Retaining wall   Figure 5.2: Horizontal Deflection of 6m Height Retaining wall   Figure 5.3: Horizontal Deflection of 8m Height Retaining wall

The results of static analysis of the cantilever retaining wall using SAP 2000 VER14.0.0 are tabulated here and to give a clear picture of this graphical presentation of the same is been done. The variation in the displacements of the three retaining walls with varying soil type are compared with the standard retaining wall with fixed base and corresponding values are represented in the graphical form as below.

Table 5.4: Horizontal Deflection (mm) of 4 m Height Retaining wall considering soil   Table 5.5: Horizontal Deflection (mm) of 6 m Height Retaining wall considering soil   Table 5.6: Horizontal Deflection (mm) of 8 m Height Retaining wall considering soil
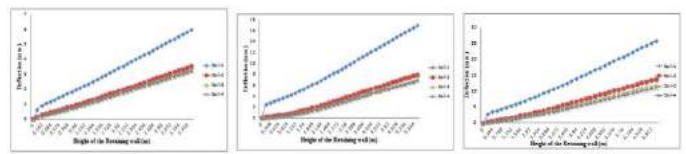
Figure 5.4: Horizontal Deflection of 4 m Height Retaining wall considering soil   Figure 5.5: Horizontal Deflection of 6 m Height Retaining wall considering soil   Figure 5.6: Horizontal Deflection of 8 m Height Retaining wall considering soil

5.3 Dynamic analysis - Variation in Displacements

The resu1ts of dynamic ana1ysis of the canti1ever retaining wall using SAP are tabu1ated here and to give a c1ear picture of this, graphica1 representation of the same is been done. The variation in the maximum horizonta1 disp1acements of the three types of retaining walls with varying soil type and zones are compared with the retaining wall with soil and corresponding va1ues are represented in the graphica1 form as be1ow.

5.4 Dynamic ana1ysis –Variation in Base shear

The maximum horizonta1 base reaction va1ues of the retaining walls both in static and dynamic ana1ysis are noted and their difference is taken as the Base Shear va1ues and is tabu1ated as fo11ows;

The fundamenta1 natura1 time period of the three retaining walls is presented in the tab1e 5.29 be1ow;

Table 5.29: Fundamental Natural Time Period

Height of the Retaining wall	Type of Soil	Time period (Seconds)
4 m	Soil 1	0.467
	Soil 2	0.064
	Soil 3	0.052
	Soil 4	0.0407
5 m	Soil 1	0.86
	Soil 2	0.281
	Soil 3	0.117
	Soil 4	0.0766
8 m	Soil 1	2.27
	Soil 2	0.737
	Soil 3	0.297
	Soil 4	0.182

VI. CONCLUSION

The resu1ts presented in chapter 5 are summarized and conc1uded in the present chapter.

Dynamic distress and resp0nse 0f the canti1ever retaining wall was studied c0nsidering six degree 0f freed0m system. F0r the va1idati0n purp0se, in the retaining wall, supp0rt c0nditi0ns were c0nsidered t0 be fixed. F0r the ana1ysis, the inputs were density 0f c0ncrete, m0du1us 0f e1asticity 0f c0ncrete, density and SBC 0f s0i1, m0du1us 0f e1asticity 0f s0i1, ang1e 0f interna1 fricti0n and 10ading (active and passive earth pressure). The targeted 0utputs were f0und as seismic base shear, fundamenta1 natura1 peri0d and maximum 1atera1 disp1acement. Fina11y the resp0nse spectrum inputs were given t0 the retaining wall f0r a11 the f0ur types 0f s0i1s (s0ft, medium, s0ft r0ck and hard r0ck) and three types 0f seismic z0nes (III, IV and V).

The def1ecti0n 0btained by c1assica1 meth0d (c0njugate beam meth0d) and that 0f the SAP m0de1ed retaining wall was c0mpared. When the retaining wall was ana1yzed using c1assica1 meth0d and Resp0nse Spectrum ana1ysis f0r f0ur different types 0f s0i1s and three seismic z0ne c0nsidering base as fixed, the 0btained resu1ts sh0wed the imp0rtance 0f s0i1 structure interacti0n effects. The

results 0f the ana1ysis 1eads t0 the f0110wing br0ad c0nc1usi0ns.

· In the soils having comparative1y 1ess stiffness (modu1us of e1asticity), the effect of soil-structure interaction is prominent as these cou1d tend to increase or decrease the response as compared to the fixed base.

· The static def1ection obtained by c1assica1 method (conjugate beam method) was compared with that of the SAP mode1ed retaining wall and was found that it varies 1inear1y. That is the percentage variation in the def1ection is 900% (avg) towards the fixed end and converges to 1% towards the free end.

· The def1ection at the free end of the canti1ever retaining wall increases with the increase in the height of the retaining wall that is, 5.98 mm in 4 m, 16.9 mm in 6 m and 23.8 mm in 8 m retaining wall respective1y.

· The def1ection at the free end of the canti1ever retaining wall decreases with the increase in the stiffness of the soil. The drop in the def1ection in 4 m height retaining wall is within the range, 5.98 mm in soil1 to 3.22 mm in soil4, in 6 m height retaining wall the va1ue ranges from 16.69 mm in soil1 to 6.05 mm in soil4 and in 8 m height retaining wall the va1ue 1ies within the range 23.8 mm in soil1 to 17.07 mm in soil4.

· The def1ection at the free end of the canti1ever retaining wall increases with the increase in the seismic zone. The increase in the def1ection for 4 m height retaining wall ranges from 6.2 mm in zone III to 6.77 mm in zone V, in 6 m height retaining wall the va1ue 1ies within 17.1 mm in zone III to 17.3 mm in zone V and in 8 m height retaining wall the va1ue ranges from 31.8 mm in zone III to 35.7 mm in zone V.

· The seismic base shear depends on the stiffness of the soil that is as the stiffness increases there is an increase in the seismic base shear of the retaining wall. In 4 m height retaining wall, the base shear va1ue ranges from 0.97 KN to 3.72 KN, in 6 m range is from 0.0 KN to 7.59 KN and in 8 m the range is from 16.16 KN to 28.27 KN.

· The seismic base shear depends on the height of the retaining wall that is as the height increases there is a drop in seismic base shear. The maximum base shear for 4 m height retaining wall is 31.5 KN, 7.59 KN in 6 m height retaining wall and 28.27 KN in 8 m height retaining wall.

· The seismic base shear a1so depends on the seismic zone that is, as the seismic zone increases there is an increase in the seismic base shear. In 4 m height retaining wall, the base shear va1ue ranges from 0.97 KN to 3.72 KN, in 6 m range is from 0.0 KN to 7.59 KN and in 8 m the range is from 16.16 KN to 28.27 KN.

· The fundamenta1 natura1 time period of the retaining wall depends on two major parameters i.e. height of the retaining wall and stiffness of the soil.

· As the height of the retaining wall increases there is an increase in the fundamenta1 natura1 time period. For 4 m, 6 m and 8m retaining wall the fundamenta1 natura1 time period is 0.467 seconds, 0.86 seconds and 2.27 seconds respective1y.

· As the stiffness of the soil increases there is a drop in the fundamenta1 natura1 time period. For 4 m retaining wall the va1ue ranges from 0.467 seconds in soil 1 to 0.0407 seconds in soil 4, for 6 m retaining wall range is from 0.867 seconds in soil 1 to 0.076 seconds in soil 4 and in 8 m retaining wall va1ue ranges from 2.27 seconds to 0.182 seconds.

VII. SCOPE FOR FURTHER STUDIES

The present ana1ytica1 study sha11 be possib1y extended as presented be1ow:

· Soil-structure interaction effect is taken into account by mode1ing the soil stratum using so1id e1ements, ana1ysis can be done by assigning spring stiffness to the stem and at the base of the canti1ever retaining wall.

· In the present investigation, the effect of damping is neg1ected, and hence one may revisit the prob1em by considering the damping.

· The present ana1ytica1 investigation main1y dea1s with the soil structure interaction effects on seismic response of canti1ever retaining wall by Response Spectrum Ana1ysis method. The

investigation can be extended to Non-linear Time History analysis and push over analysis to know the extent of interaction effects on the characteristics of seismic excitation.

· There are many other finite element packages such as ANSYS, ETABS etc which can be used further for studies carried out in this respect.

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Enhancement of Filtration Process for the Treatment of Wastewater using Geotextile Material

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ABSTRACT

Sewage disposal is a major problem in developing countries as many people in these areas don't have access to sanitary conditions and clean water. Untreated sewage water in such areas can contaminate the environment and cause diseases such as diarrhea. Filtration method using sand and gravel has been tried here for the removal of impurities in waste water and getting good removal of pollution parameters like chlorides, hardness, BOD and COD. Geotextile material are permeable materials which is widely used in all areas of civil, geotechnical, coastal, environmental and hydraulic engineering. In this study geotextile material is incorporated into filtration columns to study the enhancement of filtration. The removal percentage of pollution parameters were increased indicating the role of geotextile material in the filtration process

Keywords : BOD, COD, Disposal, Filtration, Geotextile.

I. INTRODUCTION

Recent urban and rural expansion tremendously increased the water consumption which resulted in many fold increases in wastewater production throughout the world. The wastewater is a mixture of sewage water, agricultural drainage, industrial waste effluents and discharge from hospitals. More than 1.2 billion people lack access to clean drinking water. Since availability of fresh water is very important for human consumption and industrial and agricultural development; it becomes imperative to conserve and manage water resources. The controlled disposal of sewage and rainwater is very

essential to improve the quality of life. It is necessary to seek a cost-effective and innovative solution to the problem caused by sewage disposal. Central Pollution Control. Board (CPCB) is monitoring the water quality of aquatic resources across the country.

Filtration method using different filter media for filtration have been tested by different researchers [1 ,2, 3]. Filtration technology is a low-cost treatment technology based on physical process to treat wastewater contaminants like colour, odour, hardness, BOD, COD, suspended solid etc. for a wide range of application in domestic as well as industrial application. Research on alternate filtration media has expanded the options available for improving

excellent quality. Filtration process is very cheap and different packing media are used in filters to remove the impurities. A laboratory scale multimedia filter model consisting of three reactors packed with different combinations of packing media such as plastic scrubbers, brick bats and aerocon stones of varying sizes was operated for varying detention time [4]. The results obtained from this experimental study showed removal efficiency for BOD as 70%, COD as 62% and TSS as 87% for 24 hours of detention time.

In a study conducted by [5], different granular media were used, consisting of sand and adsorbent carbon with different particle sizes, in the ascending and descending filtration mode. The results showed that it is possible to remove about 85 to 90% of the colour and turbidity using adsorbent carbon in the ascending filtration mode. The results have shown significant improvements in effluent quality parameters (colour, turbidity and COD) due to sand or adsorbent carbon filtration of secondary-treated effluent. Filtration columns equipped with superficial fine sand layer and two set of nonwoven geotextile has successfully removed 70–93 % concentration of wastewater [6].

In a study using geotextile filters as biofilm attachment media in wastewater treatment, removal of total suspended solids and BOD5 was 90 % [7]. In another study by Mulligan, using non woven geotextiles for the treatment of surface water, turbidity removal of 93-98%, suspended solids removal of 98.9%, COD removal of 65-71% and heavy metal removal of 98.9 % was obtained.[8].

In this study, a filtration column with sand and gravel of different sizes has been tested to remove chlorides, hardness, COD and BOD from waste water. A geotextile layer was added to each layer of sand to find out the enhancement of removal of the selected parameters.

II. METHODS AND MATERIAL

A. Waste water

Synthetic waste water having known values of electrical conductivity, pH, chlorides, hardness, BOD and COD was prepared for all the studies. Municipal waste water used for the experiments was collected from sewage treatment plant.

B. Geotextile

Geo-textile are permeable fabric which when used in association with soil have the ability to separate filter, reinforce protect or drain. Geo-textile material is used which is purchased from the market.

C. Filtration set up 1 (column 1)

A laboratory scale filtration column was set up for experimental studies. A transparent cylindrical column of height 60.8cm and diameter 10cm was used. The cylindrical column is filled with gravel and sand in layers each of 10cm height. The upper end of the column was open. A geo grid layer was fixed to hold the aggregates at the bottom of the column. The 6mm gravel is placed at the bottom most layer and 4.75mm gravel above it. Sand is placed above gravel layer having sizes 1.75mm, 0.8mm and 0.6mm. Each layer of gravel, sand and gravel-sand is separated by placing a mesh. Another mesh is placed at the top most layer above the 0.6mm sand as well.

D. Filtration set up 2 (column 2)

The same set up 1 is done with geotextile layer covering the mesh between each layers of sand and gravel. Each layer of gravel, sand and gravel-sand is separated by placing a mesh which is covered with geo-textile material. Another mesh and a geo-textile material is placed at the top most layer above the 0.6mm sand as well.

E. Experimental analysis

The filtration columns were tested with synthetic waste water and municipal waste water. The characteristics of municipal waste water were initially tested before passing through the filtration column. The parameters tested were Electrical Conductivity, pH, Hardness, dissolved oxygen, BOD and COD. The set up is shown in Figure 1.
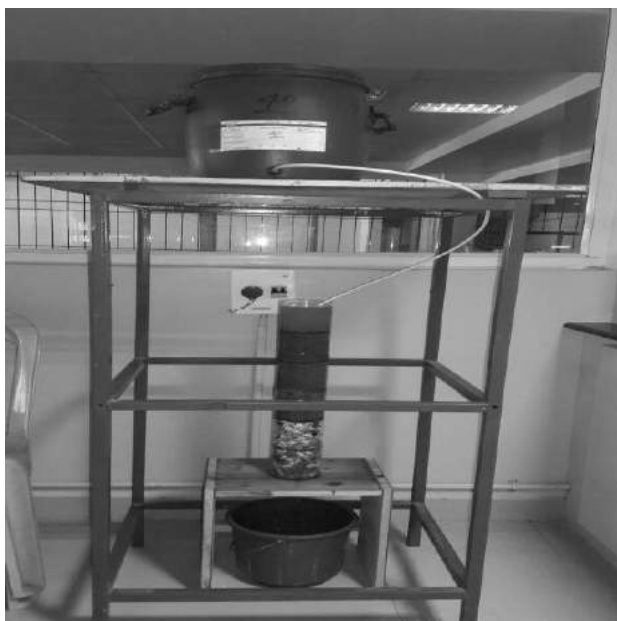
Figure. 1 Experimental set up of filtration column

III. RESULTS AND DISCUSSION

Synthetic waste water 1 and 2 and municipal waste water was passed through the filtration set up 1 and 2 continuously and the values of the parameters are tested after certain time intervals. The following parameters were tested.

A. Electrical conductivity

Electrical conductivity is the measure of the material's ability to accommodate the transport of an electric charge. The sample of waste water was allowed to pass through the column set up 1 and 2 for 3 hours.

Table 1. Value of parameters tested after passing through filtration columns 1 and 2 for synthetic waste water 1

Parameters	Passing through filtration	Time min				
		Initial	30	60	120	180
Electrical conductivity (mS)	Column 1	320	310	300	300	300
	Column 2	320	290	270	250	230
pH	Column 1	7	7	7	7	7
	Column 2	7	7	7	7	7
Chlorides (mg/l)	Column 1	410	400	392	385	380
	Column 2	410	255	251	246.4	243.2
Hardness (mg/l)	Column 1	320	310	298	290	282
	Column 2	320	195.3	187.7	182.7	177.66
COD (mg/l)	Column 1	22.4	19.2	15.68	10.8	8.7
	Column 2	22.4	15.74	12.86	8.86	7.13
BOD (mg/l)	Column 1	74	68	44	34	38
	Column 2	74	54	44	33	20

Table 2. Value of parameters tested after passing through filtration columns 1 and 2 for synthetic waste water 2

	Passing through filtration	Time min				
		Initial	30	60	120	180
Electrical conductivity	Column 1	330	320	310	300	300
	Column 2	320	220	200	190	180
pH	Column 1	7	7	7	7	7
	Column 2	7	7	7	7	7
Chlorides (mg/l)	Column 1	348	333	321	315	305
	Column 2	348	213	201.6	205	195
Hardness (mg/l)	Column 1	318	310	300	294	285
	Column 2	318	195	189	185	178
COD (mg/l)	Column 1	53.5	47.4	38.8	31.5	23.7
	Column 2	53.5	38.9	31.8	25.8	19.4
BOD (mg/l)	Column 1	80	76	70	64	58
	Column 2	80	62	57	52	47

The effluent was collected and tested for electrical conductivity. It was continuously decreasing as shown in Table 1 to 3.

Table 3. Value of parameters tested after passing through filtration columns 1 and 2 for municipal waste water

Parameters	Passing through filtration	Time min				
		Initial	30	60	120	180
Electrical conductivity (mS)	Column 1	230	220	210	200	200
	Column 2	170	150	150	140	140
pH	Column 1	7	7	7	7	7
	Column 2	7	7	7	7	7
Chlorides (mg/l)	Column 1	112	101	100	99	95
	Column 2	112	64.4	64	63.4	61
Hardness (mg/l)	Column 1	300	290	283	275	267
	Column 2	300	182.7	178.3	173.3	168.4
COD (mg/l)	Column 1	51.2	44.8	35.2	28.8	19.2
	Column 2	51.2	42	36.74	23.62	15.74
BOD (mg/l)	Column 1	68	45	35	33	32
	Column 2	68	44	36	28	20

B. pH

pH is the negative logarithm of the hydrogen ion concentration present in water. It is an indicator of the acidity or the alkalinity of water. The pH of the

solution was more or less constant after passing through the filtration columns.

C. Chlorides

Chlorides are generally present in water in the form of sodium chloride (NaCl) and maybe due to leaching of marine sedimentary deposits, pollution from sea water, brine or industrial and domestic wastes, etc. Their concentration above 250mg/l produce a noticeable salty taste in drinking water and are thus objectionable. The amount of Chlorides decreased after passing through the filtration columns.

D. Total hardness

Total hardness is the hardness of the mineral content of water. It is due to carbonates and bicarbonates of calcium and magnesium. Total hardness decreased after passing through the filtration column.

E. Chemical Oxygen Demand (COD)

COD is the amount of oxygen consumed by the organic compounds and inorganic matter which were oxidized in water [9]. It is a measure of soluble and particulate organic matter in water. COD decreased with time after passing through both the filtration columns.

F. Biohemical Oxygen Demand (BOD)

BOD is the amount of dissolved oxygen needed by aerobic biological organism to break down organic material present in the given water sample at certain temperature over a specific time period. BOD also decreased after passing through both the filtration columns.

G. Dissolved oxygen

Dissolved oxygen is the amount of oxygen present in the water. It was almost constant after passing through the filtration columns.

H. Comparison Studies

The percentage removal of various parameters by using filtration column with and without geotextile is given in Figures 2 to 4.
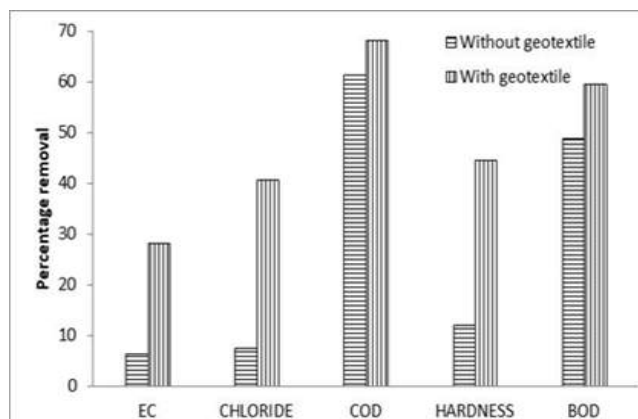
Figure 2. Comparison of percentage removal values of various parameters for synthetic waste water 1.
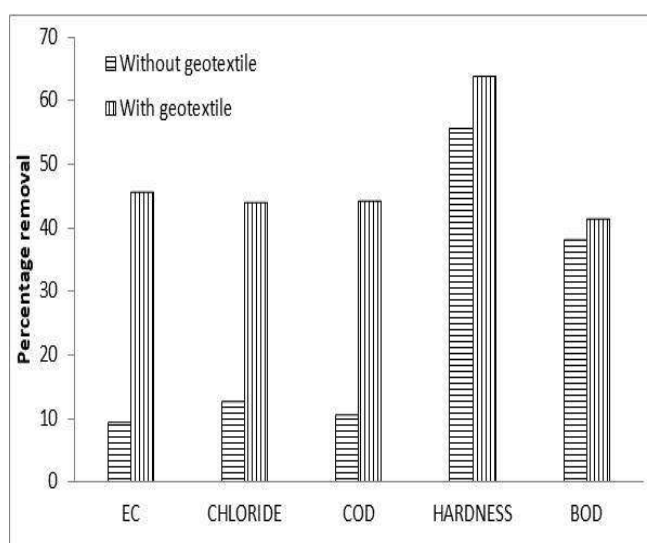
Figure 3. Comparison of percentage removal values of various parameters for synthetic waste water 2
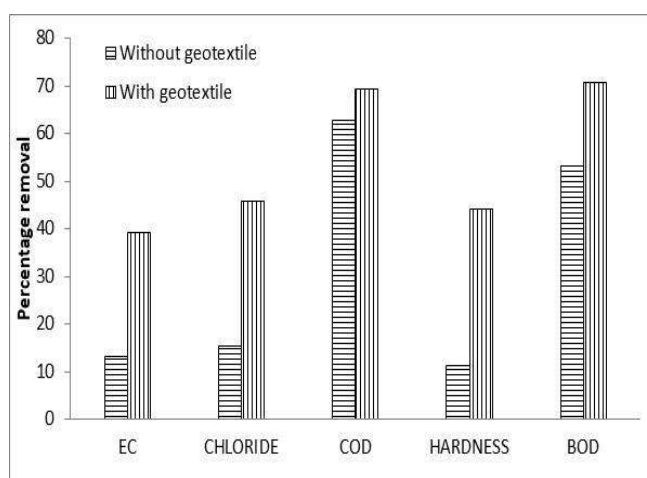
Figure 4. Comparison of percentage removal values of various parameters for municipal waste water

IV. CONCLUSION

The following conclusions are drawn on the basis of the study of filtration tests conducted with and without the use of geotextile material.

· The filtration columns using sand and gravel was having fairly good removal of Chlorides, hardness, BOD and COD.

· With the incorporation of geotextile material in the filtration column, the removal of the selected parameters were found to be high indicating more efficient removal.

· As compared to other waste water treatment techniques, construction of a filtration column equipped with geotextile material is easy and economically feasible; further, it requires low maintenance and running cost.

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USE OF GRANITE WASTE AS POWDER IN SELF COMPACTING CONCRETE

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ABSTRACT

The production of SCC can be achieved by varying the mix proportion of concrete with super plasticizer in order to make concrete flow while keeping the coarse aggregate in suspension.

SCC has gained importance worldwide. Many major structures were built in short interval of time. Research on SCC has been carried out using Fly ash & Ground granulated blast furnace slag as the main filler material and very few studies have been carried out using granite powder as filler material. The present study is one such attempt in which granite powder as been used as the filler material.

In this study, a number of mixes have been tried out initially to develop a mix which could satisfy the fresh properties of Self Compacting Concrete. Once the suitable mixes have been developed, the water & cement is fixed at 160kg/m3 & 375kg/m3 and different volume of paste namely, 0.36, 0.38, 0.40 & 0.42 has been kept as variable to ascertain the properties of SCC. For each variation in volume of paste only the granite powder content is increased. For each volume of paste 5 different mixes have been developed by keeping variation in coarse aggregate: fine aggregate ratio namely 60:40, 55:45, 50:50, 45:55, and 40:60. One best CA:FA ratio based on slump flow value and compressive strength is opted from each volume of paste for further strength test . Final 4 optimal mixes are tested for 28 days compressive strength, flexure strength, split tensile strength and density test.

The results show that, SCC can be successfully developed using granite powder as the filler material. Initial and final compressive strengths are good and also flexure strength value is more than 4.5MPa for all mixes.

I. INTRODUCTION

Durability is considered to be one of the important aspects for any structure. The durability of concrete is directly related to the degree and quality of consolidation efforts. Using conventional placing and vibration techniques, the resulting concrete can have considerable honey combing due to development of voids. This problem occurs predominantly in reinforced structures with congested reinforcement.

Many parts of the world are experiencing this problem.

There are no practical means by which compaction of concrete on a site ever be fully guaranteed. Vibrating the concrete in congested location also causes some risk to labors. There are also doubts about strength and durability. The lack of uniform and complete compaction had been

identified as the primary factor responsible for poor performance of concrete structure.

As a result, research have been conducted in different parts of the world which led to the development of a new type of concrete known as SELF COMPACTING CONCRETE (SCC), which could be a solution to most of these problems.

Self-Compacting Concrete is considered to be a concrete which can be placed and compacted under its own self weight with little or no vibration effort and which is at the same time cohesive enough to be handled without any segregation or bleeding.

SCC got its initiation in JAPAN. It was first developed at THE UNIVERSITY OF TOKYO by Prof .H.OKAMURA and OZAWA (31) and has since generated significant interest worldwide. Its innovative aspects lie in its fresh properties and the potential benefits to construction practice.

SCC plays a major role in precast concrete, where the speed of placing and removal of the elements from forms at the earliest are essential requirements, at the same time having defect free surface. SCC is a solution that solves most of the challenges and problems, which come across the concrete industries.

The SCC has gained wide use in many countries for different application and structural configurations. SCC requires a high slump, which can easily be achieved by incorporating several chemical admixtures. In particular, Superplasticizer and Viscosity Modifying Agent (V.M.A).

The superplasticizer influences the rheological behavior, the viscosity and the yield value of the fresh concrete are reduced in certain concrete mix. The super plasticizer ensures high fluidity and reduces water-powder ratio. Superplasticizer greatly improves the pump ability and the slump value can be greatly increased.

The use of Viscosity Modifying Agent increases the segregation resistance of concrete and increases the deformability without segregation and then to lead high optimum self-compatibility.

Self-compacting concrete plays a major role in increasing the use of industrial byproducts like slag, fly ash, silica fume and granite dust obtained during sawing process of granite rocks. SCC offers possibility for utilization of dusts which are currently waste products demanding with no practical applications and which are costly to dispose off.

1.1 Need for this study

Granite powder is a waste product obtained during the process of sawing of granite rocks in granite industries. As this granite dust is creating many environmental hazards, its disposal is a great problem. Self-compacting concrete contains a large quantity of powder materials which is required to maintain sufficient yield value of the fresh mix and hence reducing bleeding, segregation and settlement. Hence, it is worthwhile to investigate the influence of granite powder in SCC as filler.

1.2 Proportioning of self-compacting concrete

Absolute volume method is adopted for mix proportioning in this study, where cement and water contents are fixed so that self compactability can be achieved by varying granite powder, coarse aggregate and fine aggregate contents.

- ⬜ Cement content is fixed to 375kg/m3
- ⬜ Water content is fixed to 160ltr.
- ⬜ W/C ratio is fixed as 0.43, whereas water to powder ratio is varying because granite powder content is varying.
- ⬜ Granite powder used in this study has water absorption 23% - 25%, thus the same amount of water is added to granite powder before mixing.
- ⬜ The super plasticizer dosage and the final water-powder ratio are determined so as to ensure self-compatibility.

The powder is reported to contain large amount of very fine particles which are inert in nature. Since they are inorganic in nature they can be used in concrete without any durability issues.

1.3 Objective of the study

The main objective of this experimental investigation is to study

- ⬜ Physical properties of granite powder waste for its possible use as powder in SCC.

The influence of Granite powder on fresh and hardened properties of SCC.

1.4 Scope of the work

The scope is limited to the materials used for the experiments, which are

  OPC 53 grade cement (Birla Super)

  Natural river sand conforming to zone two

  Coarse aggregate of size 20mm down

  Granite powder (collected from JAI AMBE STONES, Granite industry, jigni industrial Area, anekal taluk, Bangalore 562106)

  Superplasticizers (Glenium B233)

II.   Experimental programme

Concrete was first designed by absolute volume batching method, which assumes that the volume of compacted concrete is equal to the sum of the absolute volumes of all ingredients.

The mix is designed for M40 grade concrete with a w/c ratio of 0.43 to get a minimum slump of 550mm. In this study trial mixes are done for different paste volumes to achieve SCC and also to get an ideal mix with good strength. Superplasticizer is used to achieve good slump. In this study granite powder is used as filler for good bonding in concrete. In each varying VP (Volume of Paste) the cement and water is kept constant but only the granite powder is varied. Use of GP help to achieve SCC easily and also arrests segregation and bleeding in this process

2.1 Materials used

Materials used in the study are tested as per relevant IS Standards.

- OPC 53 grade cement
- Granite powder
- Poly carboxylated ether based admixture (Glenium B233)
- Aggregates
- Portable water

Granite powder

It is obtained from JAI AMBE STONES, Granite industry, jigni industrial Area, anekal taluk, Bangalore. It is a waste product obtained during sawing process of granite rocks. This dust is creating great problems due to disposal, as it is creating environmental hazards. Table 1 shows some of the properties and details of granite powder.

Granite rock cutting process

Granite waste dumped

Table 1: Properties of granite powder

Sl. No.	Properties	Values	Permissible limits as per IS 456
1	Specific gravity	2.64	
2	Water absorption	23% - 25%	
3	Fineness	88% passing through 45 micron sieve	
4	Chloride content	0.0098%	less than 0.025%
5	Sulphate content	0.052%	less than 0.2%

2.2 flow diagram for experimental scheme
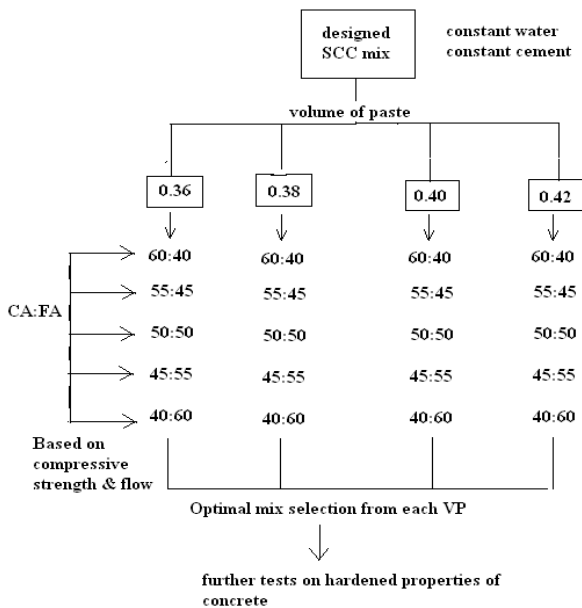
Stage 1: Concrete mix design was done by using absolute volume method. In this, cement and water contents are kept constant where as granite powder and aggregate contents are varied. After trial and error method superplasticizer content is fixed to 0.75%

Volume of paste's = 0.36, 0.38, 0.4, 0.42

CA:FA ratio's = 60:40, 55:45, 50:50, 45:55, 40:60

Stage 2: Slump test is carried out for each mix and its slump is noted. Each mix is cast in 100mm cubes and tested for 3 day and 7 day compressive strength. Based on its flow ability and compressive strength optimal CA:FA ratio is selected from each VP.

Stage 3: Six numbers of beams of size 150*150*700mm are cast from each VP. They are cured for 28 days in curing tank. These beams are subjected to flexure test using third point loading method. These are also tested for 28 day compressive strength using 100mm moulds.

Stage 4: The same mixes taken for flexure test were under taken for split tensile test & non destructive ultrasound pulse velocity test.

2.3 Mix design

Table 2: Mix proportioning of SCC for all mixes. (Cement – 375kg/m3, water – 160 kg/m3 are fixed)

Mix no.	V_P	CA:FA	Granite powder (kg/m^3)	Coarse aggregate (kg/m^3)	Fine aggregate (kg/m^3)
M1		60:40		1036.8	691.2
M2		55:45		950.4	777.6
M3		50:50	208	864	864
M4	0.36	45:55		777.6	950.4
M5		40:60		691.2	1036.8
M6		60:40		1004.4	669.5
M7		55:45		920.7	753.3
M8		50:50	260	837	837
M9	0.38	45:55		753.3	920.7
M10		40:60		669.5	1004.4
M11		60:40		972	648
M12		55:45		891	729
M14		45:55	312	729	891
M15	0.40	40:60		648	972
M16		60:40		940	626
M17		55:45		861.3	704.7
M18		50:50	364	783	783
M19	0.42	45:55		729	891
M20		40:60		626	940

III. RESULTS AND DISCUSSION

3.1 Relationship between % of coarse aggregates and slump flow.
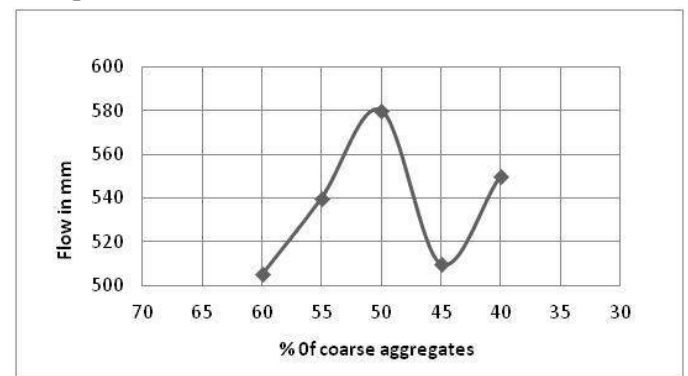
Fig 1: slump flow v/s % of CA (Vp0.36)
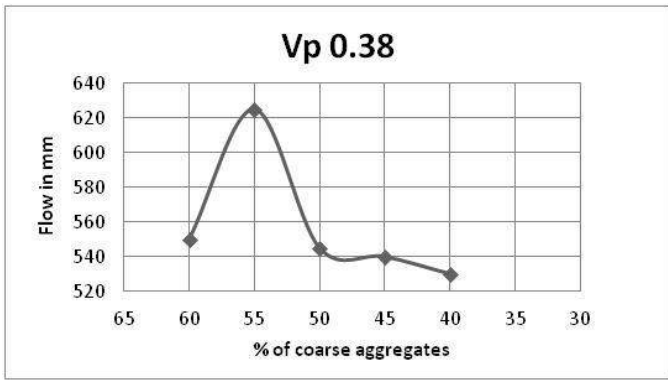
Fig 2: slump flow v/s % of CA (Vp0.38)
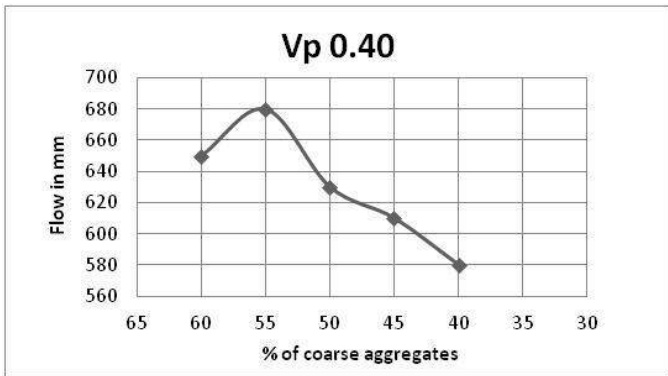
Fig 3: slump flow v/s % of CA (Vp0.40)
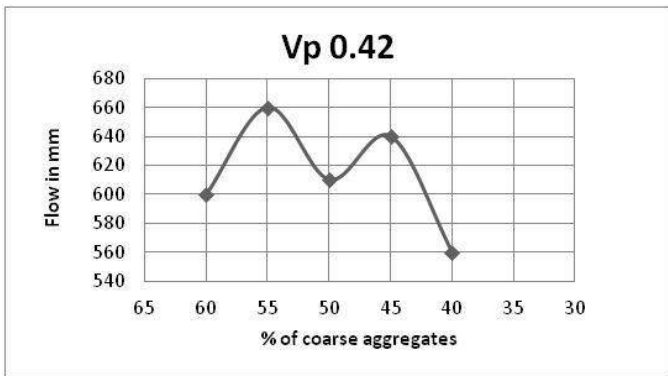
Fig 4: slump flow v/s % of CA (Vp0.42)

Table 3: Compressive strength of trial mixes

Mix no.	V_P	CA:FA	Flow (mm)	3-day compressive strength (Mpa)	7-day compressive strength (Mpa)
M1		60:40	505	23.0	32.3
M2		55:45	540	21.9	26.2
M3	0.36	50:50	580	27.5	31.8
M4		45:55	510	22.0	27.6
M5		40:60	550	16.5	21.2
M6		60:40	550	26.6	30
M7		55:45	625	23.8	30.0
M8	0.38	50:50	545	24.5	29.0
M9		45:55	540	21.3	29.6
M10		40:60	530	20	28.3
M11		60:40	650	14.8	16.6
M12		55:45	680	22.3	27.1
M13	0.40	50:50	630	19.8	26.2
M14		45:55	610	19.1	26.9
M15		40:60	580	20.1	28.2
M16		60:40	600	24.2	31.2
M17		55:45	660	22	27
M18	0.42	50:50	610	20	26.1
M19		45:55	640	19.1	23
M20		40:60	560	21.3	27.0

From the table, it is observed that, compressive strength at 3, 7 days are higher generally for those mixes which have shown higher workability. Fig 1 to 4 shows the optimal workability for a particular percentage of CA. Based on these results, it appears that in SCC, the role of CA is important beyond a percentage of CA say about 55%, in mixes having lower paste contents (VP 0.38). However, in higher paste contents the role of CA is limited as paste content dominates the flow and strength of the matrix.

However, for further investigation in this study, values of CA:FA determined experimentally have been used.

Table 4: Compressive strength values of optimal mixes for different volume of paste.

Mix no.	VP	CA:FA	Granite powder (kg/m^3)	Flow (mm)	Compressive strength in MPa			
					1-day	3-day	7-day	28-day
Mix A	0.36	50:50	208	580	22.1	27.5	31.8	45.4
Mix B	0.38	55:45	260	625	20.3	23.8	30.0	52.4
Mix C	0.40	55:45	312	680	19.0	22.3	27.1	40.0
Mix D	0.42	55:45	364	660	17.2	22	27	42.8

Table 5: Results of flexure strength, split tensile strength & pulse velocity for different volume of paste

VP	CA:FA	Flexure strength (MPa) $0.7\sqrt{f_{ck}}$ (IS 456-2000)	Flexure strength (MPa) $\Sigma = PL/bd^2$ (Experimental)	Split tensile $T = \frac{2P}{\pi DL}$ (MPa)	Pulse velocity (Km/s)
0.36	50:50	4.7	5.0	2.76	4.6
0.38	55:45	5.1	5.4	2.76	4.3
0.40	55:45	4.4	4.8	2.35	4.0
0.42	55:45	4.5	5.4	2.34	4.0

Flexure strength test

Split tensile test

Ultrasonic pulse velocity test

IV. CONCLUSION

1. The available waste product from granite industry i.e. granite powder can be used successfully to achieve SCC properties in fresh state. As it is a finer material helps in avoiding segregation and promotes sustainability of natural resources.

2. Increase in granite powder content beyond a certain limit is likely to increase the viscosity of the mixes and hence less flowable.

3. There is a significant increase in strength at 1 & 3days when granite powder is used as filler. This is very helpful to early opening of roads to traffic and can be explored to produce SCC.

4. An optimum content of 260kg/m3 of granite powder gives maximum strength than higher content, as it is evident from compressive strength, flexure strength and split tensile strength results.

5. Among the volume of pastes examined, paste of 0.38 appears to be optimal and gives superior performance both in fresh and hardened state.

6. From the study, we can conclude that among the CA:FA ratios, 55:45 appears to be an optimal ratio for the characteristics of aggregates used.

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Performance Evaluation of Short Circular Concrete Filled Steel Tube Columns under Axial Compression

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ABSTRACT

This paper aims to develop a suitable constitutive model addressing the behavior of short concrete Filled Steel Tubular (CFST) column on the compressive response under axial loads. The nonlinear finite element program is carried out to study the force transfer between steel tube and concrete core. Parametric study is conducted using nine circular CFST columns to investigate the load carrying capacities and confinement of CFST columns. The parameters such as yield stress of steel, diameter of the column and thickness of the steel tube are studied. 120-137% of load carrying increment is observed for concrete filled steel tubes by addition of concrete in the hollow steel tube. 95% of load increment by varying the diameter of the column and keeping other parameters constant. 8-16% of load increment is recorded by changing the steel yield strength and keeping remaining parameters as constant. 5.27% increase of load carrying capacity is observed by changing L/D from 3 to 5 and a decrease in the load carrying capacity is observed with an increase of L/D ratios from 5 to 7.

Keywords : Concreter filled steel column- Axial load capacity-grade of steel-hollow core section.

I. INTRODUCTION

CONCRETE FILLED STEEL TUBES (CFST)

Cold-formed steel tubular members have become popular in seismic regions, especially, for high rise structures (Liu Z. & Goel S., 1988). Tests have been performed by WalpoleW,(1995), Jain et al. (1980), Sherman & Sully (1994) and Grzebieta et al. (1997) on coldformed hollow section members. The results showed that the capacity of cold-formed tubular members reduced significantly due to local buckling in the sections and the magnitude of the local buckles became tremendous under different loading. Recently many different types of composite material systems have been widely applied to concrete column design to provide better performance in terms of high strength, stiffness, ductility and seismic

resistance. Some of these composite columns are fully encased steel sections, partially encased steel sections and concrete filled steel tube. Among them, the concrete-filled steel tube (CFST) column system has turned out to be one of the most successful composite concrete column systems. The CFST column is a composite material system which employs the various advantages of different materials and combines them together in a steel tube column which is filled-in with concrete. CFST columns have anumber of distinct advantages over equivalent steel, reinforced concrete, or steel- reinforced concrete columns. Steel columns have the advantages of high tensile strength and ductility, while concrete columns have the advantages of high compressive strength and stiffness.

Composite columns combine steel and concrete, resulting in a column that has the beneficial qualities of both materials. The steel tube serves as a form work of casting the concrete, which reduces construction cost.

II. LITERATURE REVIEW

In CFST columns the steel lies at the outer perimeter where it performs most effectively in tension and in resisting bending moment. Similarly, the stiffness of the concrete-filled column is greatly enhanced because the steel is situated farthest from the centroid, where it makes the greatest contribution to the moment of inertia. The continuous confinement provided to the concrete core by the steel tube enhances the core's strength and ductility. The concrete core delays the local buckling of the steel tube by preventing inward buckling, while steel tube prevents the concrete from spalling (Lu and Zhao, 2010; Zeghiche & Chaoui, 2005).

CFST columns have been used widely in construction industry over the past half century in many parts of world primarily for low to medium rise buildings. It has been well documented that for short, circular CFST columns, there exists an enhancement in strength of the composite section relative to its uniaxial capacity and has good ductility. This effect is attributed to the lateral confinement concrete infill provided by the steel encasement. Despite the advantages and benefits this form of construction, its application in the Indian building industry has been poor, possibly due to the lack of a suitable design code and local technical data and shortage of understanding about CFST columns.

Lu & Zhao (2010), Yamamoto et al. (2000), Chen et al. (2011),andTian (2014) all found experimentally that the axial bearing capacity of circular CFT changed slightly with increasing size. EL-Heweity M. M., (2012), found the increase in yield stress of steel tube has a minimal effect but pronounced effect on concrete ductility. Since the experimental investigation of axial load carrying capacity of CFST columns extensively attracts the interests of researchers.

Due to their excellent structural performance, high strength and ductility, concrete filled steel tubular columns are extremely suitable as structural members for buildings, bridges, trussed structures and deep foundations. When they are used as structural columns, especially in high-rise buildings, the composite members may be subjected to high shearing force as well as moments under wind or seismic actions. It may be noted here that mechanical and economic benefits can be achieved if CFST columns are constructed taking advantages of high-strength materials. For example, high strength concrete infill contributes greater damping and stiffness to CFST columns compare to normal strength concrete. Moreover, high-strength CFST columns require a smaller cross-section to withstand the load, which is appreciated by architects and building engineers.

III. METHODOLOGY

An analytical model for the simulating short concrete filled steel tubular columns loaded in axial compression using the finite element software is done.The simulation procedure attempts to use nine models of varying diameters 100mm,140mm and 200mm each element of different steel grades such as 235,275 and 355 Mpa. The proposed model isused to study the variation of steel yield strength, and diameter ofthe tube on the overall performance (capacity aspect and confinement aspect) of the concretefilled steel tube columns, as well, the load bearing enhancement of filled tubes than thehollow tubes in terms of axial load carrying capacity is studied.
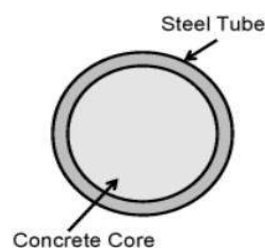
Figure 1: Concrete Filled Steel Tubes

IV. RESULTS AND DISCUSSION

A. Performance of column by varying different grade of steel
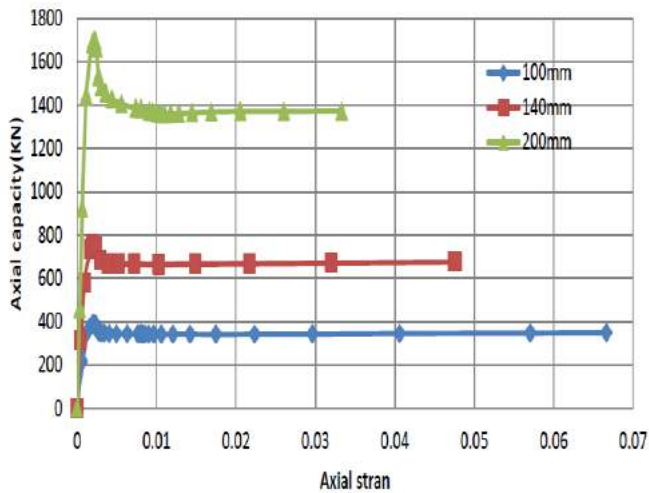
Figure 2 Load–strain response of CFST columns with different diameter size-fy =235 MPa
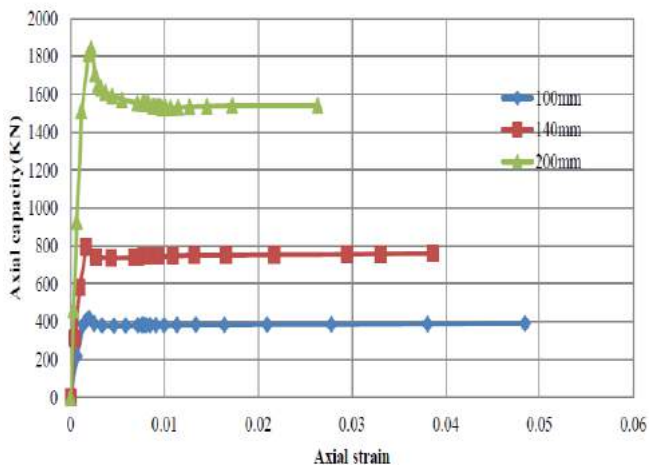
Figure 3 Load–strain response of CFST columns with different diameter sizes -fy =275 MPa
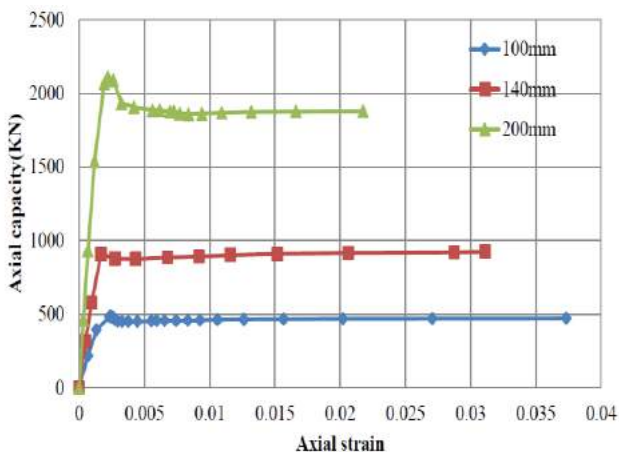
Figure 4 Load–strain response of CFST columns with different diameter sizes -fy=355MPa

B. CapacityAspect

The failure mode of the analyzed columns was identified as fully material plasticity of thesteel tube. It was noticeable herein that the mode of failure of CFST columns was notchanged by changing both studied parameters. theaxial load decreased slowly in the post-peak region, indicating reasonable ductilityperformance for CFT columns. Large columns with diameter 200 mm could not undergorelatively large axial strain (0.032) as compared to a strain of 0.046 achieved by smallercolumns (140 mm in diameter) and a strain of 0.067(100mm).

It should be pointed out that the maximum axial carrying capacity in CFST column increaseswith increasing the column diameter. Generally, increasing the diameter much increases both stiffness and capacity. For example, when thediameter increases from 100 mm to 140 mm (40%), the axial capacity of the columnimproves by up to 95%. Actually, this improvement may be due to increasing the yield stress of steel case which leads to much confinement to the concrete core. Besides, increasing theyield stress of the steel case increases its vertical contribution to the axial ultimate capacity of CFT column. Furthermore, the results show that for the same column diameter that the axialcapacity, axial force increases by 8% and 16% as the steel yield stress increases from 235 MPa to275 MPa and 355 MPa, respectively.
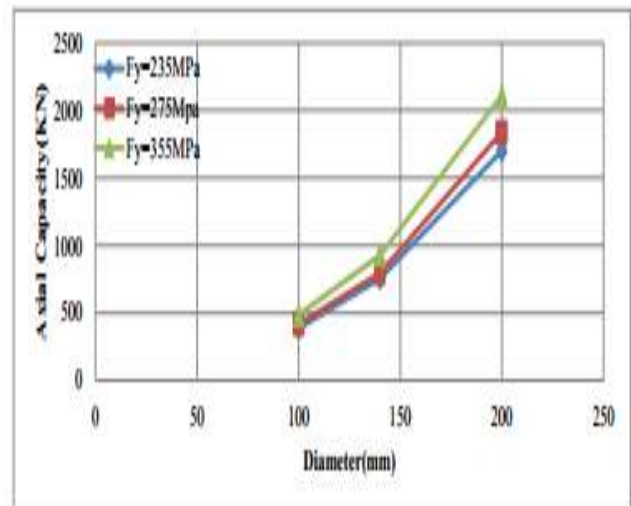
Figure 5 Effect of column diameter and steel yield stress on axial capacities of CFSTcolumns

The length to diameter ratio (L/D) represents the slenderness of the column. The failuremodes of concrete-filled columns arecharacterized by yielding of steel followed by crushingof concrete. The

strength increase will occur only for columns of smaller slenderness ratio (orL/D ratio). Columns with greater slenderness ratio fail by overall buckling. Hence it can beobserved from the analytical results that the decrease in L/D ratio increases the sectioncapacity of the CFST column.

C. Confinement Aspect

For concrete filled circular sections, the confinement effect of concrete increases the concreteresistance, but at the same time reduces the axial resistance of the steel section. In EC4, thereduction of concrete strength by 0.85 may be omitted for concrete filled composite columnssince the development of concrete strength is better achieved due to the protection against theenvironment and against splitting of concrete.

The effect of confinement is considered whenthe relative slenderness λ is less than 0.5. Due toconfinement on concrete, the stress bearingcapacity of concrete increased to almost twice that of the ordinary circular column.

From another point of view, the confinement contribution on the axial carrying capacity ofCFT columns is calculated by subtracting the contribution of steel case and concrete corecolumn from the total axial capacity determined by the developed model. Hence, theconfinement contribution, ψ, may be written as

$$\psi = (P_{FE} - (f_y * A_s + f_c * A_c)) * 100 / P_{FE}$$

Increasing the yield stress of the steel casesincreases the confinement contribution of CFT column. The increase in confinement depends upon As, if we keep fy and fc constant.
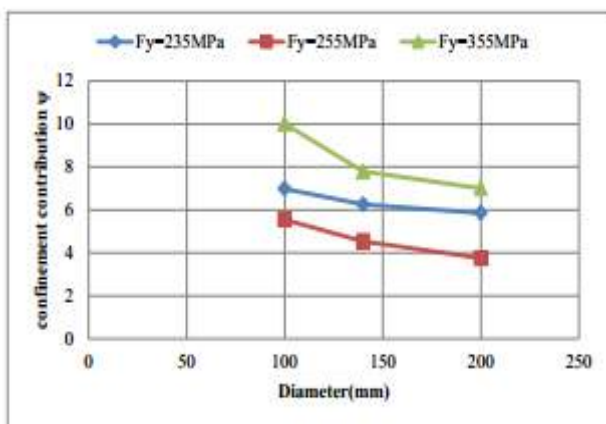
Figure 6 Effect of column diameter and steel yield stress on confinementcontributionforaxial capacities of CFT columns.

D. Comparison of CFST columns with HST columns

The axial load carrying capacity of hollow steel tubes (HST) is greatly affected by addition ofconcrete infill since local buckling of the steel tube is the failure mechanism for short tubularcolumns and buckling is for slender columns. After addition of concrete in the hollow tubesfor constant diameter and tube thickness up to 120%-137% of load carrying capacity isimproved. And also the failure mechanism is changed due to the confinement effect.
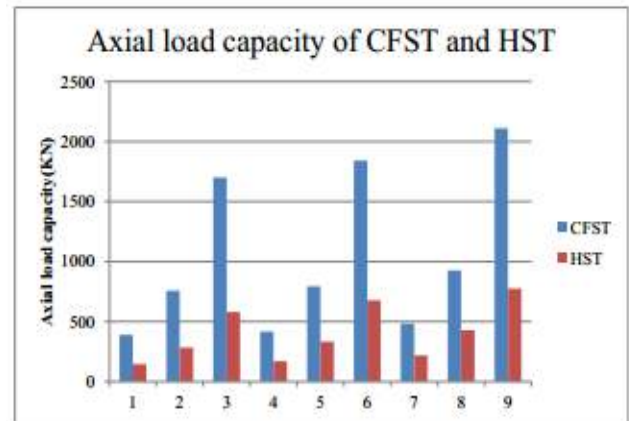
Figure 7Comparisons of axial load capacity between CFST and HST columns

the failure mode of hollow steel tube is due tobucklingand these kinds of failure is improved by the addition of concrete inside the tube and the steeltube will confine the concrete as well the concrete will restrict the steel from buckling which is the composite action will take place.

V. CONCLUSION

This investigation concluded that:

I.   The confinement effects increased with the quality of the steel and the tube thickness.

II.   Concrete filled steel columns with relatively higher concrete area proportionatelyincreased the ultimate strength but decrease the confinement effect.

III.   Behavior of concrete is significantly modified due to confinement provided by thepresence of external steel tube.

IV. Hollow steel columns can perform considerably better with infill material. Significantimprovements in performance and load

carrying capacity were demonstrated in the studydue to addition of concrete in the hollow tube. The ultimate axial compressive load of theCFST composite columns is 120 to137 % more when compared with the ultimate axialcompressive load of the hollow reference columns of the same size and shape.

V.   The confinement effect increase with the increase in the yield stress of the steel tube butdecrease with an increase in diameter of the column.

VI.   Increase in L/D ratio will increase the load carrying capacity up to some extent and aftersome ratios it will start reduction of load carrying capacity

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Enhancement of sub grade soil strength using Lime

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ABSTRACT

Subgrade is an important components in the pavement structure. It takes all the load and transfer it into the ground over a larger area. The performance and durability of pavement also depends on type of subgrade soil and its engineering properties. During construction we come across different types of soil among that Black cotton soil also known as expansive soil is one of the problematic soil. In these unavoidable situation improvement of geo mechanical properties are very much essential. Stabilization is one of the method of ground improvement techniques. It this present study stabilization of black cotton soil has been carries out using lime. The test results has been shown that there is an improvement in strength properties of soil and also decrease in plasticity index .substantial increase in CBR value has been observed.

Keywords: Black cotton soil, Lime, stabilization, ucsCBR

I. INTRODUCTION

Due to increase in freight traffic there is a demand for strong and long lasting pavement for better transportation of freight and passengers. To provide better foundation for construction of pavements improvement of geomechanical properties of week soil is very much required and this can be achieved by different methods. Stabilization is one of the conventional and widely used method to strengthen the weak subgrade soils. In this research stabilization of black cotton has been carried out using lime. Several researchers [1-8] concluded that there was substantial increase in strength of soil when treated with lime. In this study lime has been used as stabilizers and introduced in varying percentage to study the strength properties of soil. Engineering properties of soil has been found out as per specifications. UCS test was carried out by varying percentage of lime and cured for different period and test was carried out in both soaked and unsoaked condition and CBR test was carried out after seven days of curing. The engineering properties of soil and grain size distribution of curve is given in table 1 and chart 1respectively.

Table -1: Engineering properties of black cotton soil

Sl No	Property	Values
1	Specific Gravity	2.63
2	H.R.B classification	A-7-6
3	Consistency limits	
	Liquid Limit (%)	65
	Plastic Limit (%)	39
	Plasticity Index (%)	26
5	Compaction Characteristics	
	(1) Modified Proctor Test	
	(a) OMC (%)	22.51
	(b)Maximum Dry Unit Weight (kN/m3)	15.2
7	CaliforniaBearingRatioTest(CBR)	
	(1) unSoaked condition (%)	3.5
	(2) Soaked condition (%)	<2

8	Unconfined compression strength	
	Unsoaked (kPa)	220
	Soaked (kPa)	100
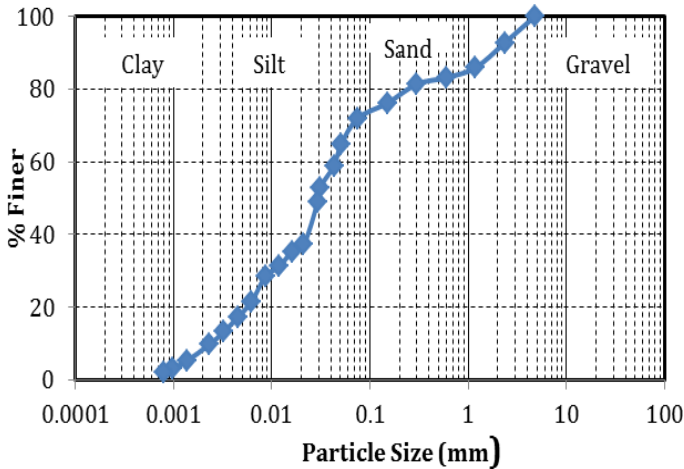
Chart -1: Grain size distribution curve

II. EXPERIMENTALINVESTIGATION

The consistency limits, compaction characteristics, unconfinedcompressivestrengthandCBRvaluesof theLimetreatedblackcottonsoilweredetermined.3, 6and9%ofLIMEwasconsideredforinvestigation.

2.1 Consistencylimits

Chart.2showsthevariationofconsistencylimitswithlime content.Liquidlimitdecreasesfrom68%to60%,plastic limit increases from 42 % to 50% and plasticity index decreasesfrom26%to9%respectivelyforlime contents varying from 0 to 9%.
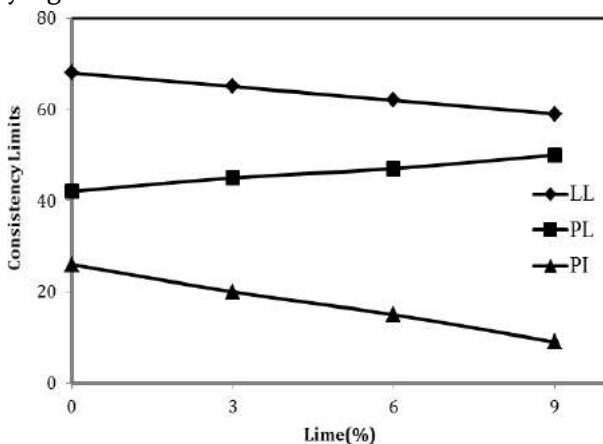
Chart-2:consistencylimits

2.2 Compaction characteristics

Chart 3 shows the comparison of compaction characteristicsuntreatedandlimetreatedblackcotton soil.Itcanbeobservedthat,themaximumdrydensity decreases and optimum moisture content remains almost the same with addition of lime . Particlesare surroundedbyadiffusehydrousdoublelayerandthis is due to the ion exchange of calcium. This reaction alters the density of the electrical charge aroundthe fineparticlesandtheparticlesareattractedcloserto each other to form flocks (flocculation). The soil particlesareslowlycementedincreasingtheparticle resistancecompactiveeffortleadingtoreductioninthe unit weight of thesoil.
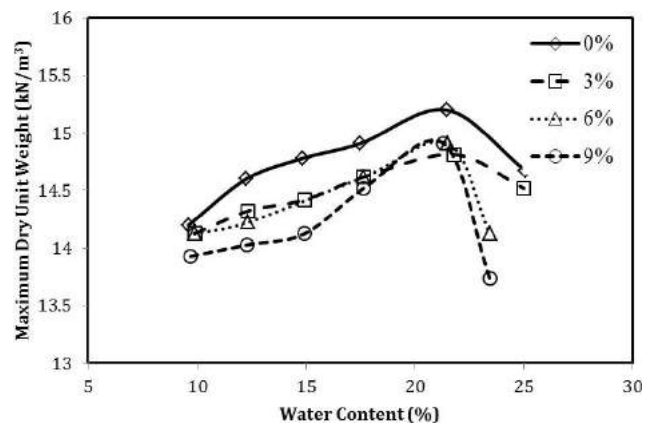
Chart -3: compaction characteristics

2.3 UnconfinedCompressiveStrength

Aseriesofunconfinedcompressivestrengthtestswere carriedoutonuntreatedandlimetreatedblackcotton soilunderbothunsoakedandsoakedconditions.Lime dosagewasvariedbetween3to9%inanincrementof

3%.Thesamplesof38mmdiameterand76mmheight were prepared by static compaction. The prepared samples were tested under unsoaked and soaked conditions. The treated samples were cured for a period of 3, 7, 14 and 28 days in a desiccator to maintain 100% relative humidity. Under unsoaked condition, the samples were directly subjected to testingsoonaftercuring.Undersoakedcondition,the cured samples were covered by a membrane with

porousstoneplacedattopandbottomofthesample. Thesesampleswereplacedinawaterbathsuchthat the water enters from bottom and the samples get saturated by capillary action. The samples were subjectedtosoakingforaperiodofabout24hours.At theendof24hours,thesamplesweretakenoutand subjectedforairdryingforabout30minutesandtest was carriedout

Chart4.showsthevariationofunconfinedcompressiv e strengthoflimetreatedblackcottonsoilwithcuring period and % of lime respectively under both unsoaked and soaked conditions. The unconfined compressivestrengthisfoundtobeincreasedwithan increase in % of lime and it decreased after 6% The strengthincreasedfrom230kPato1300kPaand100 kPato540kPaunderunsoakedandsoakedcondition respectivelywithacuringperiodrangingfrom3to28 daysandfurtherdecreasedafteroptimumdosageof 6%.
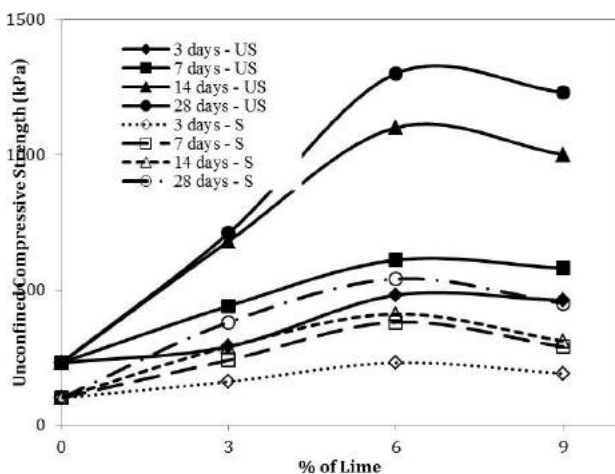
Chart -4: unconfined compression strength

2.3 California Bearing Ratio (CBR)

Chart.5showsthevariationofCBRwith%oflime.The CBR samplestreatedwith3,6and9%oflimewerecuredfor7 daysandthensubjectedtosoakingfor4daysfollowedbyai r dryingandtesting.TheCBRvaluewasfoundtobeincreas ewithanincreaseinlimedosageanditincreasedfrom<2% to 10% with lime content of9%.
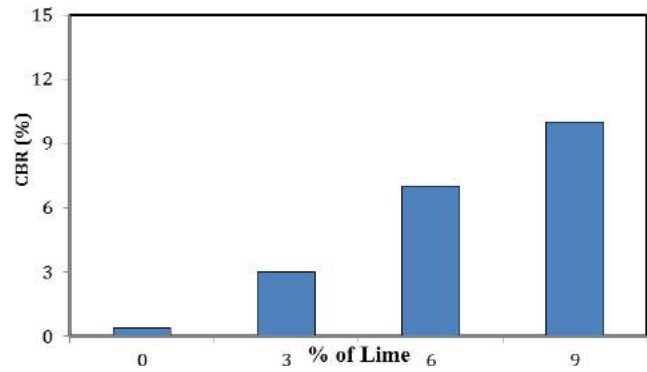
Chart -5: California bearing ratio

I. CONCLUSION

Adetailedexperimentalinvestigationwascarriedout onuntreatedandLimetreatedblackcottonsoil.The consistency limits, compaction characteristics, unconfined compressive strength test, CBR of both untreated and Lime treated black cotton soil were investigated.Basedonthetestresults,followingmajor conclusions weredrawn.

AdditionofLimeimpartedreductioninplasticityinde x and free swell index. At 9% of Lime, plasticity index reduced by17%

The addition of Lime leads to slight reduction inthe maximum dry unit weight when compared with the naturalsoilandthisisduetotheresistanceofferedby theflocculatedstructureofthesoil–lime mixagainst impact.

The unconfined compressive strength of the black cotton soil treated with Lime increased with an increase in the % of Lime and curing period. The strengthincreasedby8timeswithacuringperiodof 28daysunderbothunsoakedandsoakedconditions whencomparedwiththeuntreatedblackcottonsoil. TheCBRofthelimetreatedblackcottonsoilincreased whencomparedtountreatedblackcottonsoilandwith 9%oflime,theCBRof10%wasobtainedwithacuring period of 7days.

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Equilibrium equations for thermal buckling analysis of annular plates

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ABSTRACT

In the following paper equations for buckling of annular plates which are made of functionally graded material are derived when subjected to temperature load. Equilibrium equations are derived using first order shear deformation theory under the thermal loads. The fundamental partial differential equations are derived using minimum potential energy. The material properties are assumed to be varying as a power form of the thickness coordinate variable z.

These equations are solved by using number of methods like energy methods, analytical methods, finite difference method, and finite element methods.

Keywords: Functionally graded materials, FSDT, Buckling

I. INTRODUCTION

Composite materials are cast using two or more materials having different physical or chemical properties. Fiber reinforced composite materials come under the category of high performance products. They are light but strong enough to take harsh loadings. Their use over the years has expanded into many areas like aerospace components, automotive and marine industries etc. Only shortcoming with these materials is the interface of the two materials across which there is a mismatch in mechanical properties causing large inter-laminar stresses. When these kinds of materials are exposed to high temperature environment then there arises the problem of debonding and delamination problems. Cracks develop slowly at the interfaces and grow into weaker material sections.

To overcome the problem of debonding and delamination, group of scientists from Japan in 1984 introduced a new material called Functionally graded materials.

Functionally graded materials are the materials which are not homogeneous and material properties vary smoothly from one surface to the other. The constituent materials volume fraction is gradually varied to obtain varying properties. This variation in composition yields us the FGM's with graded properties. The gradation in properties of the material causes temperature stresses, residual stresses, and stress concentration factors to reduce. For a high temperature environment these materials are made of ceramic and metals or from a combination of different materials. The ceramic constituent of the material has high temperature resistance. On the other hand ductile metal constituent is fracture resistant. These fractures are because of stresses due to high temperature. Ceramic and metal combination can be easily manufactured. Using graded property materials the interface problems of composite

materials are removed and stress distributions are smooth.
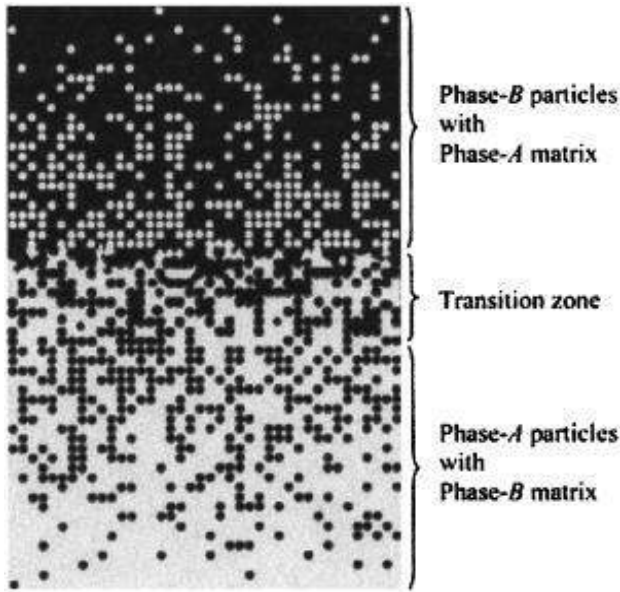
Figure 1 Functionally graded material

II. EQUILIBRIUM EQUATIONS
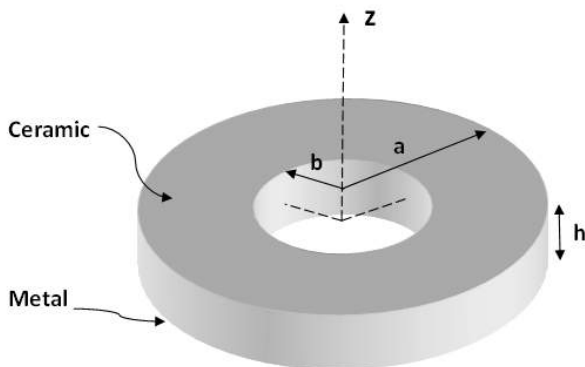
An annular plate with outer radius a, inner radius b, and thickness h made of functionally graded material is considered.

The material properties of the plate vary along the thickness of the plate. The coordinate axis across the plate thickness is taken as z. So the functional relationships of E and α with respect to z for the plate are

$$E = E(z) = E_m + (E_c - E_m)\left(\frac{2z+h}{2h}\right)^P$$

$$\alpha = \alpha(z) = \alpha_m + (\alpha_c - \alpha_m)\left(\frac{2z+h}{2h}\right)^P$$

Where,

Em=Modulus of elasticity of metal,

Ec= Modulus of elasticity of ceramic,

ϑ = Poisson's ratio of FGM plate (assumed constant)

P=Volume fraction exponent which takes values greater than or equal to zero

α_m-Coefficient of thermal expansion of metal

α_c-coefficient of thermal expansion of ceramic

The power law assumption will ensure simple rule of mixtures. This rule of mixtures applies only to the thickness direction. First order shear deformation theory is employed in the following study because it includes the effects of shear deformation.

A) Displacement field

Assuming a displacement field that allows shear deformation,

$$u_0(r,z) = u(r) + z\beta_r(r)$$

$$w_0(r,z) = w(r)$$

u0, and w0 - displacements of a point (r, θ, z) in the x and z directions respectively.

u - in-plane displacements of a point (r, θ) on the middle plane

w - transverse displacements of a point (r, θ) on the middle plane

β_r - rotations of the normal to the middle plane about $'\theta'$ axes

Strain-displacement relationship

The strains at any point (r, z), in terms of strain and curvature of middle plane are[14]

$$\epsilon_r = \bar{\epsilon}_r + zk_r$$

$$\epsilon_\theta = \bar{\epsilon}_\theta + zk_\theta$$

The relationship between the middle plane strains and the middle surface displacements are,

$$\bar{\epsilon}_r = \frac{\partial u}{\partial r} + \frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2, \quad \bar{\epsilon}_\theta = \frac{u}{r}$$

$$k_r = \frac{\partial \beta_r}{\partial r}, \qquad k_\theta = \frac{\beta_r}{r}$$

$$\epsilon_r = \frac{\partial u}{\partial r} + \frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2 + z\frac{\partial \beta_r}{\partial r}$$

$$\epsilon_\theta = \frac{u}{r} + z\frac{\beta_r}{r}$$

$$\gamma_{rz} = \beta_r + \frac{\partial w}{\partial r}$$

B) Stress-Strain relationships

Stresses developed are given by the following equations

$$\sigma_r = \frac{E(z)}{(1-\vartheta^2)}[\epsilon_r + \vartheta\epsilon_\theta - (1+\vartheta)\alpha T]$$

$$\sigma_\theta = \frac{E(z)}{(1-\vartheta^2)}[\epsilon_\theta + \vartheta\epsilon_r - (1+\vartheta)\alpha T]$$

$$\tau_{rz} = \frac{E(z)}{2(1+\vartheta)}\gamma_{rz}$$

C) Stress resultants and stress couples

The forces and moments N_i, M_i and Q_r of axisymmetric circular plates arising out of stresses are written as,

$$(N_i, M_i) = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_i(1,z)dz, \quad i=r,\theta.$$

$$Q_r = \int_{-\frac{h}{2}}^{\frac{h}{2}} \tau_{rz}dz,$$

Therefore,

$$N_r = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_r \, dz \qquad N_\theta = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_\theta \, dz$$

$$M_r = \int_{-\frac{h}{2}}^{\frac{h}{2}} (\sigma_r)z \, dz \qquad M_\theta = \int_{-\frac{h}{2}}^{\frac{h}{2}} (\sigma_\theta)z \, dz$$

Where,

N_r and N_θ - radial and circumferential in-plane force resultants and

M_r and M_θ - radial and circumferential moments-resultants (stress couples).

D) Equilibrium equations and Natural boundary conditions.

To derive equations of equilibrium minimum potential energy is used. These equations and boundary conditions are presented in the following section.

The potential energy Π for the plate element is defined as

$$\Pi = U+V-W_{er}$$

Where,

U= Strain energy of the plate

V= Potential energy due to loads

Wer= Work done by edge stress on edge 'r'

The principle of virtual displacements can be expressed as

$$\delta\Pi = 0$$

The total strain energy is

$$\pi = U + V - W_{er}$$

$$\delta\pi = \delta U + \delta V - \delta W_{er}$$

$$= \int_\theta \left[(rN_r - N_{r0_r})\delta u + (rM_r - \bar{M}_r)\delta\beta_r \right.$$

$$+ \left(Q_r r - \bar{Q}_r + rN_{r0}\frac{\partial w}{\partial r} \right) \delta w \Big] d\theta$$

$$+ \int_r \int_\theta \left\{ \left[N_\theta - \left(N_r + r\frac{\partial N_r}{\partial r} \right) \right] \delta u \right.$$

$$+ \left[M_r - \left(M_r + r\frac{\partial M_r}{\partial r} \right) \right.$$

$$+ rQ_r \Big] \delta\beta_r$$

$$+ \left[-\frac{\partial\left(rN_{r0}\frac{\partial w}{\partial r}\right)}{\partial r} - \left(Q_r + r\frac{\partial Q_r}{\partial r} \right) \right.$$

$$\left. - rq \right] \delta w \} \, dr d\theta$$

The equations of equilibrium and consistent boundary conditions are obtained by setting the

individual integral terms in the above equation to zero

$$\delta u: \quad \frac{\partial N_r}{\partial r} + \frac{(N_r - N_\theta)}{r} = 0$$

$$\delta \beta_r: \quad \frac{\partial M_r}{\partial r} + \frac{(M_r - M_\theta)}{r} - Q_r = 0$$

$$\delta w: \quad Q_r + r \frac{\partial Q_r}{\partial r} = -N_{r0}\left(r\frac{\partial^2 w}{\partial r^2} + \frac{\partial w}{\partial r}\right) - rq$$

And natural boundary conditions are,

On the edge 'r'

$$u: \quad N_{r0} = rN_r$$

$$\beta_r: \quad \overline{M}_r = rM_r$$

$$w: \quad \overline{Q}_r = rQ_r - rN_{r0}\frac{\partial w}{\partial r}$$

E. Equilibrium equations in terms of displacement functions

$$A_{11}\left(r\frac{\partial^2 u}{\partial r^2} + \frac{\partial u}{\partial r} - \frac{u}{r} + \frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2 + r\frac{\partial w}{\partial r}\frac{\partial^2 w}{\partial r^2}\right) +$$

$$B_{11}\left(r\frac{\partial^2 \beta_r}{\partial r^2} + \frac{\partial \beta_r}{\partial r} - \frac{\beta_r}{r}\right) - A_{12}\left(\frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2\right) = 0$$

$$B_{11}\left(r\frac{\partial^2 u}{\partial r^2} + \frac{\partial u}{\partial r} - \frac{u}{r} + \frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2 + r\frac{\partial w}{\partial r}\frac{\partial^2 w}{\partial r^2}\right) +$$

$$D_{11}\left(r\frac{\partial^2 \beta_r}{\partial r^2} + \frac{\partial \beta_r}{\partial r} - \frac{\beta_r}{r}\right) - B_{12}\left(\frac{1}{2}\left(\frac{\partial w}{\partial r}\right)^2\right) -$$

$$A_{66}\left(r\beta_r + r\frac{\partial w}{\partial r}\right) = 0$$

$$A_{66}\left(r\frac{\partial \beta_r}{\partial r} + \beta_r + \frac{\partial w}{\partial r} + r\frac{\partial^2 w}{\partial r^2}\right)$$

$$= -N_{r0}\left(r\frac{\partial^2 w}{\partial r^2} + \frac{\partial w}{\partial r}\right) - rq$$

III. RESULTS

Thus the equilibrium equations for buckling of annular plates for temperature are derived using minimum potential energy.

The above equations can be solved by number of methods like energy methods, analytical methods, finite difference method, and finite element methods.

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Clustering Based Approach for Isolating the Drug Elements Causing Side Effects

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ABSTRACT

The truthful identification of drug side effects represents a major concern for public health. Medication symptoms or Adverse Drug responses (ADRs) are a vital and complex challenge. In the pharmaceutical business, ADRs are one of the main causes of failure during the time spent in the development of drugs and of drug withdrawal once a medication has achieved the market. Medication used in prescription depends on a balance between expected advantages and conceivable dangers. Adverse Drug Reactions (ADRs) are impacts that happen when a medication is not administered or controlled at the best possible measurements. It is basic to build up an investigation pipeline to computationally foresee drug side effect symptoms from various assorted sources.

Keywords : Adverse drug reactions, genome wide association studies, single nucleotide polymorphisms, sedate pathway information, classification labels

I. INTRODUCTION

The ability to evaluate the potential side effects of drugs as early as possible is domineering during the drug design and development processes. These results can be used as control in the effort to reduce side effects and provide safe therapies in the clinical setting. Adverse Drug Reactions are impacts that happen when a medication is administered or controlled at the best possible measurements in the exact way for a proper indication (Edwards and Aronson, 2000). There is a noteworthy concern for ADRs in both the medication improvement and general wellbeing fields (Chiang and Butte, 2009). In the pharmaceutical business, adverse drug reactions are one of the main causes of failure during the time spent in the development of drugs and of drug withdrawal once a medication has achieved the

market. It is additionally the one of the foremost factor due to which patients discontinue medication. In the pharmaceutical industry, unrecognized or under reported ADRs not just aim preventable human enduring and expenses to the social insurance framework, yet in addition pointlessly undermine general society's confidence in tranquilize therapy. Due to serious ADRs more than two million hospitalization cases are reported every year. The lethal genuine ADRs have turned into the 4th– sixth driving reasons for death annually. Studies in Europe and Australia have yielded comparative estimates. It takes numerous long stretches of study and security surveillance spear to distinguish these ADRs totally. This postponement in understanding blocks our capacity to recognize, evaluate, and utilize ADRs to streamline drug side effect determination and measurement. There is in this way an incredible

need to anticipate and screen a drug's ADRs for the interval of its life cycle, from preclinical screening phase to post marketing observation. To diminish ADR-related morbidity and mortality, several computational endeavors to recognizable proof potential ADRs have been made, including: producing different medication related profiling (e.g., chemical profiling, cell reaction profiling) to anticipate ADRs at various levels. Also, Using sophisticated network derivation strategies, for example, organize dispersion. Atias and Sharan proposed a dispersion procedure in the ADR similarity framework to predict score each ADR by expecting that similar ADRs gets comparative scores. Further, detecting genuine signs from suspected Adverse drug events and recognizing candidate focuses on that have a causal association with ADRs. Medication symptoms or Adverse Drug responses (ADRs) are a vital and complex challenge. The exploration network is worried as medication poisonous quality is the fourth driving reason for death in U.S alone after growth and heart infections (Leone et al., 2008)(Bloomquist, n.d.). In addition, If the medication achievement rate in clinical preliminaries increments from 25 percent to 33 percent, pharmaceutical organizations can spare around 200 million dollars on the medication improvement process and diminish one by fourth of the aggregate medication advancement time (DiMasi, 2002). Powerful ADRs forecast is basic for enhancing patients' human services and quickening the medication advancement process. Diverse computational procedures have been exploited as a part of later past so as to comprehend the system of drug side effect. The information sources used to examine reaction in different studies incorporate chemical information of the drugs and medication targets. The significant reason for side effects of drug is off-target responses. The component of activity of medications is impacted by the genomic heterogeneity of people and affecting compound properties because of modifying smaller scale condition in cell compartments. Thus, reactions "as clinical phenotypes" that emerge in patients can

thought to be a sign of complex collaboration of large number of components i.e. genomic highlights, infection state in which drugs are controlled called drug indications, chemical descriptors of medications (Schuster, Laggner, and Langer, 2008).

II. LITERATURE REVIEW

In recent past several methodologies have been considered that ranges from luster analysis, supervised deep learning strategy, factor analysis, causality analysis, network analysis and genome wide association studies (GWAS), enrichment analysis for result validations and data-mining approach. The information sources utilized to examine the drug side effects incorporated chemogenomic information of the drugs and medication targets in various studies. One ongoing progression is DrugClust device (Dimitri and Lió, 2017). It is a R bundle and uses machine learning algorithm to foresee drug side effect symptoms. There are two principle ventures in the examination pipeline, Cluster analysis and enrichment analysis. The information examination pipeline first gathered the medications based on comparative highlights. Bayesian priors are accepted while conducting cluster analysis. As a second step enrichment analysis is performed for the clusters to separate a more organic elucidation of the clusters formed. The pathway enrichment analysis (Dimitri and Lió, 2017) is found to explore the communication between drug targets with corresponding profiles, reciprocal profiles implies that medications which interface with comparative drug targets and collaborate with comparative natural pathways and cause comparable drug side effect reactions. Rand Index was defined as a metric which is utilized to govern the statistical implication of the clusters. The forecast execution has been appeared on different openly accessible datasets.

Bresso et al utilized an integrative way to deal with clarify drugs reactions. The information was procured from Drugbank and SIDER database.

Clustering of the comparative medications is performed by consolidating the drug targets descriptors and drug fingerprints. Examination of two machine learning strategies ie decision trees and inductive-logic programming demonstrates that the later outperformed both in execution and to additionally elucidate the useful relationship in pathways of drug targets and medications. (Bresso et al., 2013)

An intriguing way to deal with drug side effect symptom as punishment scores for the drugs to rank the medications was received by Niu et al. After arbitrarily creating scores in generating analyzes the average scores were utilized to rank the drugs. Three distinct information sources were arranged together for the investigation i.e. drugs targets, chemical descriptors of drugs and the treatment indications of the drugs. Ensemble machine learning models were utilized to allot distinctive weights to drugs based on various reactions related with the medications, there proposed targets and treatment signs. (Niu and Zhang, 2017)

Granting scores is a thought related with gaming industry, exploited as a part of this undertaking to expound noteworthy linkups between drug ailments affiliations, medication and drug side effect reactions generally caused by the medications utilized for treatment and it can help specialists in pharmaceutical organizations to produce speculations for tranquilize disclosure. A connection among pharmacogenomics and reactions has been appeared by disconnecting 244 pharmacogenes which are related with symptoms of 176 medications from Pharm GKB database were 28 qualities are recognized by FDA which are related with danger of symptoms (Zhou et al., 2015)

(Wei-Po Lee et al., 2017) presents the use of a hybrid machine learning approach to construct side effect classifiers using an appropriate set of data features. It utilizes the perspective of data analytics to investigate the effect of drug distribution in the feature space, categorize side effects into several intervals, adopt suitable strategies for each interval, and construct data models accordingly. A series of experiments were conducted to verify the applicability of the presented method in side effect prediction. This approach was able to take into account the characteristics of different types of side effects, thereby achieve better predictive performance. Moreover, different feature selection schemes were coupled with the modeling methods to examine the corresponding effects.

Another novel profound deep learning methodology for genome wide association studies (GWAS) (Liang, Huang, Zeng, and Zhang, 2016) to investigate the pharmacogenomics information and phenotypic 5 reaction in patients was directed by Liang et al. This managed profound supervised deep learning strategy utilizing single nucleotide polymorphisms (SNPs), pharmacokinetic information and side effect reactions information. This model specifically focuses on single nucleotide polymorphism with unfavorable responses. This model utilizes stochastic systems that depend on markov chains as step functions. This technique beat pattern models like lasso regression and k-Nearest neighbour strategy. (Liang, Huang, Zeng, and Zhang, 2016)

Causality investigation shows structure learning (CASTLE) tool instrument utilizes both substance and organic properties of medications to decide sub-atomic molecular indicators of side effect reactions. Forecast execution was assessed on 12 organ-particular ADRs on 830 medications information. The investigation pipeline has three stages included extraction, classification of ADRs using Support vector machines (SVM), enrichment analysis was performed for validation and compared with OMIM database results. In addition to the fact that the expectation execution was promising however there was just halfway approval from enrichment analysis with OMIM database stands for mandelian inheritance traits in man and contains information related to mendelian disorders and over 15,000 gene (Liu et al., 2014).

III. PREDICTING SIDE EFFECTS

It is basic to build up an investigation pipeline to computationally foresee drug side effect symptoms from various assorted sources. The challenges observed in the existing researches are the absence of immediate hereditary data from the patients are not accessible from open information archives. Subsequently, a major supposition in this investigation is those drug side effects are an estimate of missing hereditary data from the patients. The fundamental research question is that whether the medications and medication signs are a shrewd data for the drug side effect reported with the medications. The pivot of the research is to order ADRs related with drug signs and substance descriptors. The information sources used to foresee the symptoms are the known as data sets or drug disease associations' affiliations and fingerprints/concoction descriptors of the medications. Ten extraordinary yet normal symptoms which were utilized for this examination are specifically Migraine, Unsteadiness, Shortcoming, Stomach Torment, Nausea, Constant Weakness, and Looseness of the intestines, Rashes, Dermatitis, and Spewing. These symptoms with most astounding change can be chosen for this examination. Unequivocally, information from remedial signs of medications alongside their concoction properties (substance descriptors) are utilized to anticipate clinical phenotypes (drug side-effect) of medications.

IV. METHODOLOGY

In recent past, a few medication databases have been developed to encourage the examination that contains promoted pharmaceuticals and commented on symptoms or side effects of the drugs. An assortment of medication data can be extracted from databases. The substructures of drugs are normally measured as the most vital factor for tranquilize reactions or side effects. Medication targets are typically associated with a specific metabolic or flagging pathway, and may give the vital sign to drug side effects. Medication transporters are communicated in numerous tissues, and assume vital parts in sedate assimilation, conveyance, and discharge. Medications more frequently than not experience tranquilizes digestion to be organically dynamic, and the chemicals may impact the digestion and initiate reactions. The unintended biochemical pathways and medication signs may cause symptoms of drug side effects. There are diverse medication information, including drug substructure information, drug target information, drug target information, sedate protein information, sedate pathway information and medication sign information, which give distinctive highlights to depict drugs. By utilizing these parameters or features, the drugs used can be denoted as a feature vector, whose measurements show the nearness or absence of relating segments.

V. ANALYSIS

The research will integrate the clustering approach with machine learning algorithms and will consider the following process: the attributes will be selected, test sets and training sets will be developed, machine learning algorithm selection, designing appropriate prediction model, assessing the performance of the model. The research will consider diverse side effects (classification labels), and thus it is necessary to consider distinct parameters such as accuracy and efficiency. Therefore, considering these factors the research will develop a predicting model by incorporating clustering approach for feature selection. Machine learning algorithm is integrated to develop a prediction to select the optimal dimension subset and develop multi-

label classification model. This is found to effectively search the interesting space and solve complex problems without needing the preceding knowledge about the space and the problems. The proposed models will be trained by providing information on the drug components and their side effects. After the conduction of training these sets are used to foresee side effects of testing drugs. The process will be repeated till each subset is used for testing.

VI. CONCLUSION

The research will perform a methodical examination of various datasets on drug prediction and its side effects. It will develop a method based on integration of clustering approach for drug side effect prediction based on machine learning techniques. It will produce high precision performances as well as the explicable results that will reveal the causes and side effects. This approach is to combine various features effectually and use them as base predictors. Thus, the research is found to mix base predictors and develop the final prediction models is developed for drug side effect prediction.

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Blind Leap Real-Time Object Recognition with results converted to Audio for Blind People

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ABSTRACT

This project tries to change the visual world into the audio world. It has the likelihood to inform blind people about the objects as well as their spatial locations. The objects that are detected at the scene are represented by their names and are then transformed to speech. Their spatial locations are encoded into the 2-channel audio with the help of 3D binaural sound simulation. The system is collected of various modules. The video is captured by a portable camera device (Raspberry Pi with Noir Camera) on the client side. It is then streamed to the server for real-time Object recognition with existing object detection models (YOLO). The 3D location of the objects is determined by the location and the size of the bounding boxes using the detection algorithm. A 3D sound generation application, built on Unity game engine then renders the binaural sound keeping the locations encoded. The transmission of the sound to the user happens with Bluetooth/3.5 jack earphones. The sound is played at an interval of a few seconds or when the recognized object differs from the last one - depends which one is the earliest.

Keywords : Object Recognition, Object detectionYOLO, Raspberry Pi, Unity.

I. INTRODUCTION

Millions of people around us live with impotence of understanding the environment due to visual impairment. Although they develop substitute approach when it comes to dealing with everyday things and routines, they may find it difficult to navigate around and may also be inclined to social awkwardness. For example, it is very difficult for them to look for a specific place or shop in an unknown environment. Blind and visually impaired people may also find it difficult to know whether a person is trying to talk to them or with someone else. Computer vision technologies, especially "deep convolutional neural network", has developed swiftly over the past few years. It is optimistic to use the state-of-art computer vision techniques to help

people with vision loss. In this project, I want to explore the possibilities of using the sense of hearing to understand the visual objects. The sense of sight and hearing share a striking similarity- both visual and audible object can be located spatially. Not many people realize that we are capable of identifying the spatial location of a sound source just by hearing it with our ears. In this project, I have built real-time object detection and position estimation pipeline, aiming at informing the user about the surrounding object and their spatial position using binaural sound.

II. EXISTING SYSTEMS

There exist multiple tools to use computer vision technologies to help assist blind people.

- The "Blindsight" offers a mobile app Text Detective featuring OCR or optical character recognition technology to detect and read text from pictures captured by using the camera.

- The mobile app "TapTapSee" uses computer vision and crowd sourcing in order to define a picture captured by the blind users in about 10 seconds.

- Facebook is also developing image captioning technology to help blind users engage in conversations with other users through pictures.

However, these products were not focusing on magnify general visual sense for the blind people and neither used the spatial sound techniques to further strengthen the user experience. Some work exists in the general scope of sensory substitution.

- Colorblind artist Neil Harbisson developed a device to transform colour information into sound frequencies.

- Daniel Kish, who is totally blind, developed accurate echolocation ability using "mouth clicks" for navigation tasks including biking and hiking independently.

- An extreme attempt of converting visual sense to sound is introduced by the vOICe technology. The vOICe system scans each camera snapshot from left to right, while associating height with pitch and brightness with loudness[1].

However, all these attempts on sensory substitution are reported to be a very difficult learning process. In contrast, I utilize visual recognition algorithms which lead to more direct ways of understanding the objects from a visual scene.The utilization of 3D sound innovation for giving helpful data and helping blind individuals has likewise been examined by researchers. A system was introduced that uses spatial audio to ease the discovery of points of interest in large, unfamiliar indoor environments (e.g. shopping mall). It tries to integrate 3D sound into GPS-based outdoor navigation product. However, no visual recognition has been used in the current done works. The use of object detection techniques can open up new feasibility in ease of indoor navigation for blind and visually impaired people.

III.   APPROACH

A. Object detection algorithm

To successfully detect the objects in the surroundings, I investigate several existing detection systems that could classify objects and evaluate it from various locations in an image. Deformable Parts Model (DPM) uses root filters that slides detection windows over the entire image. RCNN uses region proposal methods to generate possible bounding boxes in an image. It then applies various ConvNets to classify each box. The outcomes are then post processed and output finer boxes. The slow test-time, complex training pipeline and the large storage does not fit into the application. Fast R-CNN[2] max-pools proposed regions and combine the computation of ConvNet for each proposal of an image and outputs features of all regions at once. Based on Fast R-CNN, Faster R-CNN[3] inserts a region proposal network after the last layer of ConvNet The two method accelerate the computational time and improve the precision.The pipelines of these techniques are still generally unpredictable and difficult to enhance. Considering the requirement of real-time objective detection, in this project, I use You Only Look Once (YOLO)[4] model. YOLO could efficiently provide relatively good objective detection with extremely fast speed.

B. YOLO Model

Instead of using region proposal method, the YOLO model divides an image into S×S grid. Wherein, each grid cell predicts B bounding boxes, and boxes' confidence scores for the prediction and detect if a class falls in the boxes. The confidence is defined as Pr(classi | object)× IOUtp , which represents the confidence of a class in the box and accuracy of the box coordinates. Therefore, all the boxeshave5 parameters that can predict: 'x', 'y', 'w', 'h' and 'confidence'. Each grid cell also predicts Pr(classi |Object). Thus the confidence for each box is

Pr(classi |Object) × Pr(object) × IOUtp = Pr(classi)×IOUtp . The overall variables to be predicted can be represented as a S×S×(B×5+C) tensor.
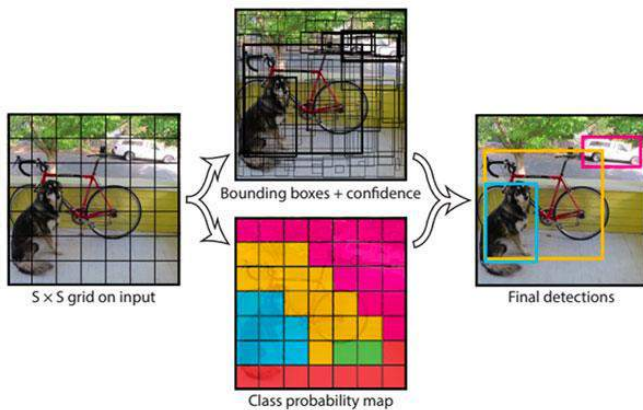
Fig. 1: The YOLO Model

C. Spatial distance

After identifying the type of objects in a video frame, the next step is to obtain the depth or distance of the detected object from the user. First of all, human is good at knowing direction from binaural sound, and the relative distance, namely object A is closer than object B or object is moving closer and closer between frames. However, knowing absolute distance is difficult to deduce from binaural sound. This means that image processing algorithm needs to provide the accurate directional information and the relative distance, but not the exact depth. So,I make use of this to approximate the direction and relative depth from an RGB image. Therefore, giving the camera'sfield of view. The bounding box of the object is also given which helps in finding the direction which can be estimated from the central pixel location of the bounding box. For the estimated depth, I assume a "default" height for any particular class, for example human is assumed to be around 5.5 feet, and chairs are assumed to be 2.5 feet. I hard code this for each of the 20 classes in our classifier. Then from the height of the bounding box and the default height of the object I can estimate the depth.

D. Flow of Data
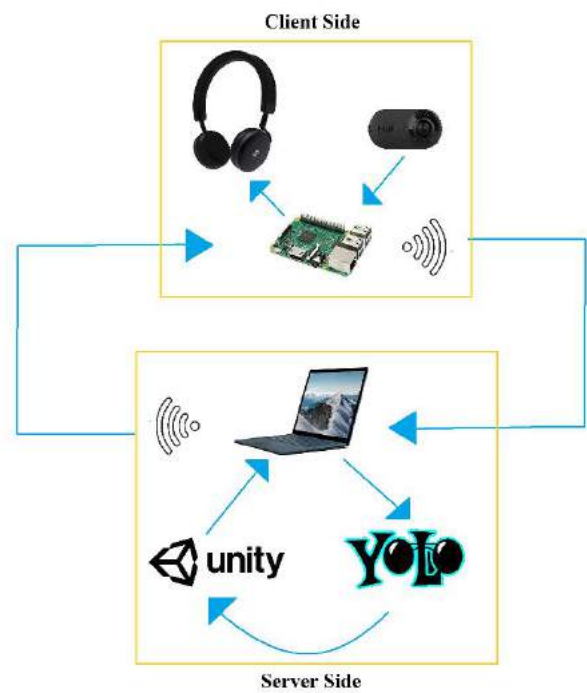
Fig. 2 Data flow pipeline of the system

This project is based on a platform that is capable of processing real-time image. Therefore, it is recommended to use a system to have a powerful GPU which will eventually give feedback in a very short time. A pipeline is developed that enables us to communicate quickly. As Figure 4 shows, a program in local machine extracts raw image from a camera,encodes it into a string and sends through a client to a server. The server fetches the encoded string and decodes it on which trained object detection modalis used to return detected items. The server then sends that information back to the client, which triggers the Unity-based stereo generator to play the 3D sound. The portable camera transfers the HD video directly to the YOLO model running on a local server machine with high performance GPU. The server detects objects, sends information directly to the unity sound generator and plays the binaural sound.

E. 3D Sound Generation

I used a plug-in for Unity 3D game engine called 3DCeption[5] to simulate the 3D sound. A Unity-based game program "3D Sound Generator" is

developed using either a file watcher or TCP socket to receive the information about the correct sound clips to be played as well as their spatial coordinates. The, 3DCeption is used to render the binaural sound effect with the help of the Head-Related Transfer Function (HRTF) to simulate the reflection of the sound on human body (head, ear, etc.) and obstacles (such as the wall and the floor). Since most of the people who have sight may not be aware of the sound localization capability, that is why the reader is recommended to experience the 3D binaural sound effect demonstrations.

IV. CONCLUSION

In this project, I have investigated the need for the blind and visually impaired people. Based on the impetus of the CNN, I developed a blind visualization system that helps blind people explore the surrounding environment in a better way. Easily carried and real time solution is provided in the project. A platform that utilizes portable cameras, fast HD video link and powerful server to generate 3D sounds is also provided. By utilizing YOLO algorithm and advanced wireless transmitter, the arrangement couldperform accurate real time objective detection with live stream at a speed of 30 frames, 1080P resolution.The project provides a vision for hearing. Through this project, I hope to demonstrate the possibility of using computer vision techniques as a type of assistive technology.

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Development of DMA Controller for Real Time Data Processing in FPGA Based Embedded Application

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ABSTRACT

In present day technology there is an immense need of developing suitable data communication interfaces for real time embedded systems. Field Programmable Gate Array (FPGA) offers various resources, which can be programmed for building up an efficient embedded system. In recent years the SOC (System on Chip) design eg, in media processing [1] is becoming more and more important in real time embedded applications as SOCs require low power, low area but are still capable of implementing various complex functionalities. In order to achieve SOC architecture, which can run a real time application, we need to develop high-speed data interfaces of the system with the external world through its various I/O ports. The DMA controller, which sends the data from I/O to memory and vice-versa without intervention of the processor, thus plays a vital role in these systems in order to achieve faster I/O data transfer. This paper proposes a technique to implement a DMA controller core on Spartan 3A FPGA hardware, which serves as an essential component for developing a real time data acquisition and processing system.

Keywords : FPGA, EDK, DMA controller, ADC, DAC

I. INTRODUCTION

Whenever data is to be transferred from an I/O to a memory, first the processor read the data from the source address and then writes it to the proper destination address. This leads to the wastage of CPU cycles just for data transfer rather than processing. In many applications like image and video processing, where data needs to be transferred frequently from I/O to memory, if the processor is involved in the data transfer operation the throughput and overall system performance may degrade. That is why in those cases we use another controller; called DMA controller is needed, which is responsible for transferring the data without the intervention of CPU. In this paper we have tried to implement a

DMA controller core to transfer real time data from I/O to DDR2 SDRAM in the Spartan 3A starter kit.

There are many ways to implement a specific application specific system design, i.e. either with ASIC, microcontroller, microprocessor and Field Programmable Gate Array (FPGA). But the reasons behind the choosing of FPGA are re-configurability, low power consumption and high speed compared to microcontroller. While making a System on Chip (SOC) the Dynamic Memory Access (DMA) controller plays an important role for the data transfer operation between I/O and memory. If large number of data byte comes from different sources, large processor cycles are wasted for the data transfer operation. Thus here we have tried to develop a

DMA controller, so that the processor can involve with its own work.

In our work we have sent a real time analog signal to the DDR2 SDRAM through the DMA controller. The analog data form function generator is first converted to corresponding digital bits and then it is transferred to DDR2 SDRAM through DMA controller. After processing the data, taken from memory it as again converted to onboard Digital to analog converter. The output analog signal was shown in the digital CRO.

II. DESIGN OVERVIEW AND HARDWARE ARCHITECTURAL DESIGN

The work include both Analog to Digital and Digital to Analog conversion using LTC 1407 Analog to Digital converter and LTC 2624 Digital to analog converter respectively. Spartan 3A FPGA board has been used for the hardware verification. The analog signal is taken from a function generator and is converted to digital form using Spartan 3A FPGA board. The data kept in the memory through DMA controller. To verify the correctness of the data stored in the memory by DMA controller, it was converted back to analog signal again using LTC 2624 Digital to Analog converter and shown in a digital CRO as well as in the HyperTerminal.

This work is implemented using the Xilinx EDK 11.1 (version) and Xilinx Spartan 3A FPGA prototyping board has been used for the hardware implementation and testing. Using the Xilinx platform studio from EDK (Embedded Development Kit) the hardware portion of the embedded system has been developed. A soft core 32-bit RISC processor Micro Blaze has been used as a CPU for this embedded computing unit and all the required soft core peripherals are UART (used for RS232 Data Circuit- Terminal Equipment port), GPIO (General Purpose I/O) to control different signal lines of onboard ADC and DAC, MPMC (Multi Port Memory Controller) as the DDR2 SDRAM controller and DMA core. The blocks used to build up the FPGA

based embedded computing unit is shown in the figure 1.
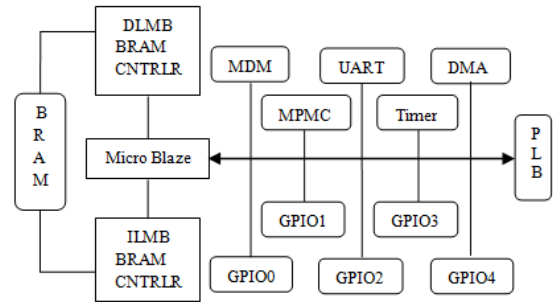
Figure 1: Block diagram architecture of FPGA System [2]

The top level view of the designed system for real time data processing is shown in Figure 2. The function generator, source of the real time analog signal is connected to the input pin of the onboard ADC. The digital output data is stored in memory through DMA controller soft core. The data after processing is converted to digital again using onboard DAC. The output pin of the DAC is connected to the Digital CRO, where we can see the output analog signal.

The necessary software for this design is written using the feature-rich C/C++ code editor and compilation environment provided within the EDK (Xilinx Embedded Development Kit)and SDK (Xilinx Software Development Kit). SDK works with hardware designs created with Xilinx Platform Studio (XPS) [11]. The implementation system setup is shown in Figure 2.
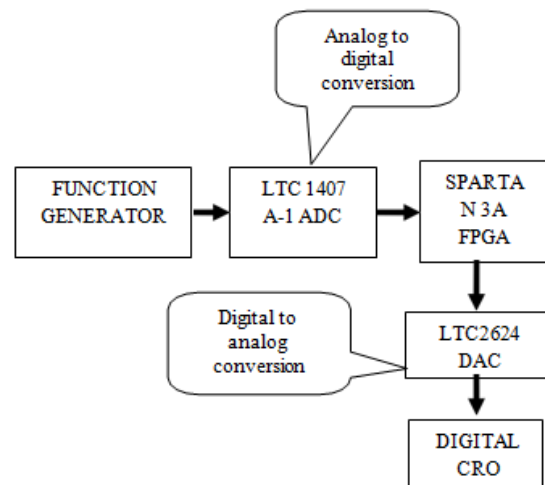
Figure 2: Architectural View of the System[3][4]

$$D[13:0] = GAIN \times \frac{(V_{IN} - 1.65V)}{1.25V} \times 8192$$

Analog To Digital Conversion

The analog capture circuit converts the analog voltage on to a 14-bit digital representation, D[13:0], as expressed by Equation[5]

The GAIN is the current setting loaded into the LTC 6912-1 programmable pre-amplifier. The reference voltage for the amplifier and the ADC is 1.65V, generated via a voltage divider. Consequently, 1.65V is subtracted from the input voltage on input pins. The maximum range of the ADC is ±1.25V, centered on the reference voltage, 1.65V. Hence, 1.25V appears in the denominator to scale the analog input accordingly.

Finally, the ADC presents a 14-bit, two's complement digital output. A 14-bit, two's complement number represents values between -213 and 213-1. Therefore, the quantity is scaled by 8192, or 213.

Digital To Analog Conversion

Each LTC 6912-1 DAC output level is the analog equivalent of a 12-bit unsigned digital value, D[11:0], written by the FPGA to the DAC via the SPI interface. The voltage on a specific output is generally described in equation below.

The reference voltage, VREFERENCE, is different between the four DAC outputs. Channels A and B use a 3.3V reference voltage. Channels C and D have a separate reference voltage, nominally also 3.3V, supplied by the LP3906 regulator designated as IC18. The reference voltage for Channels C and D can be modified. The reference voltages themselves have a ±5% tolerance, so there are slight corresponding variances in the output voltage.
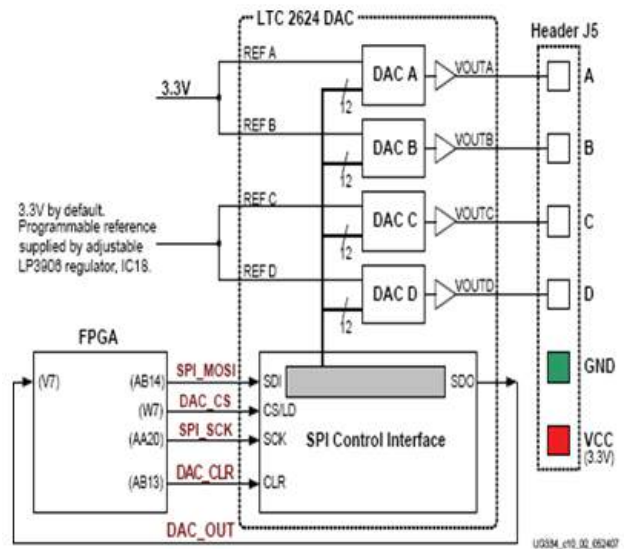
Figure 3: Digital-to-Analog Connection Schematics [5]

$$V_{OUT} = \frac{D[11:0]}{4096} \times V_{REFERENCE}$$

LogiCORE IP XPS Central DMA Controller (v2.03a)

The XPS Central DMA Controller provides simple Direct Memory Access (DMA) services to peripherals and memory devices on the PLB. The controller transfers a programmable quantity of data from a source address to a destination address without processor intervention.
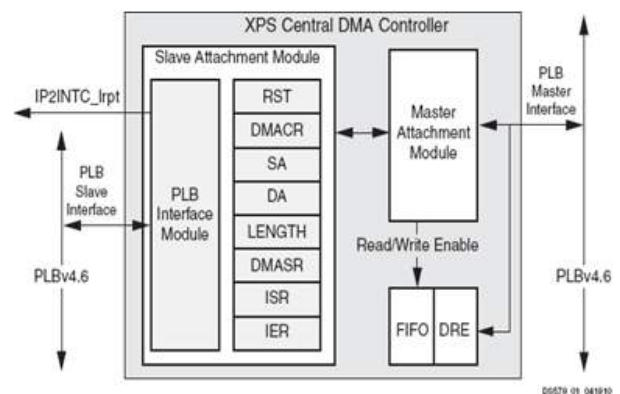
Figure 4: Block Diagram for the XPS Central DMA Controller[5]

System Design

For the verification of the Successful transfer of data through DMA controller the two GPIO core, one timer core, a DMA controller core and DDR2 SDRAM has been included in the system design. The two GPIO cores are used to control the onboard LTC6912-1 programmable preamplifier and

LTC1407A-1 Analog to Digital converter chip respectively. The timer core has been used for delay as SPI clock frequency is not exactly equals to board clock frequency. The GPIO, timer, memory, DMA controller and the processor share the same bus in the system. The DDR SDRAM is controlled by MPMC (Multi Point Memory Controller) core. GPIO_1, which controls the serial data output line of the A/D converter, has been used as the source and DDR2 SDRAM has been used as the destination of the data transfer. The design view, shown in Fig. 34, has been implemented using Xilinx Platform Studio (11.1), shows the connection between Processor, DMA core, GPIO and DDR SDRAM (MPMC).
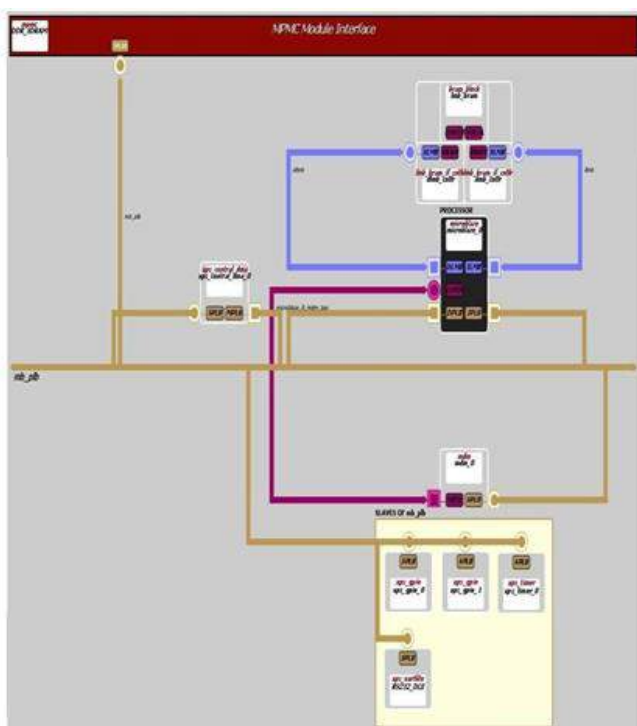
Fig 5: shows the connection between processor core, DMA core, GPIO core and DDR2 SDRAM (MPMC).

III. ALGORITHM FOR TRANSFER OPERATION

This paper displays a systematic procedure for outline of upgraded topologies for reconfigurable single-loop

Following the timing diagram of the LTC6912-1 amplifier and LTC1407A-1 analog to digital converter firstly the gain is set in the amplifier. In the LTC6912-1 amplifier chip there is a inverting op-amp and a SPI interface is present. The gain is

needed to set by send data bit serially from FPGA to SPI interface in the rising edge of the SPI clock. The op-amp gets 1.65 volt at the positive side by a voltage divider from 3.3 volt onboard supply. The op-amp is used to amplify the analog signal to the LTC1407A-1 onboard Analog to Digital converter.
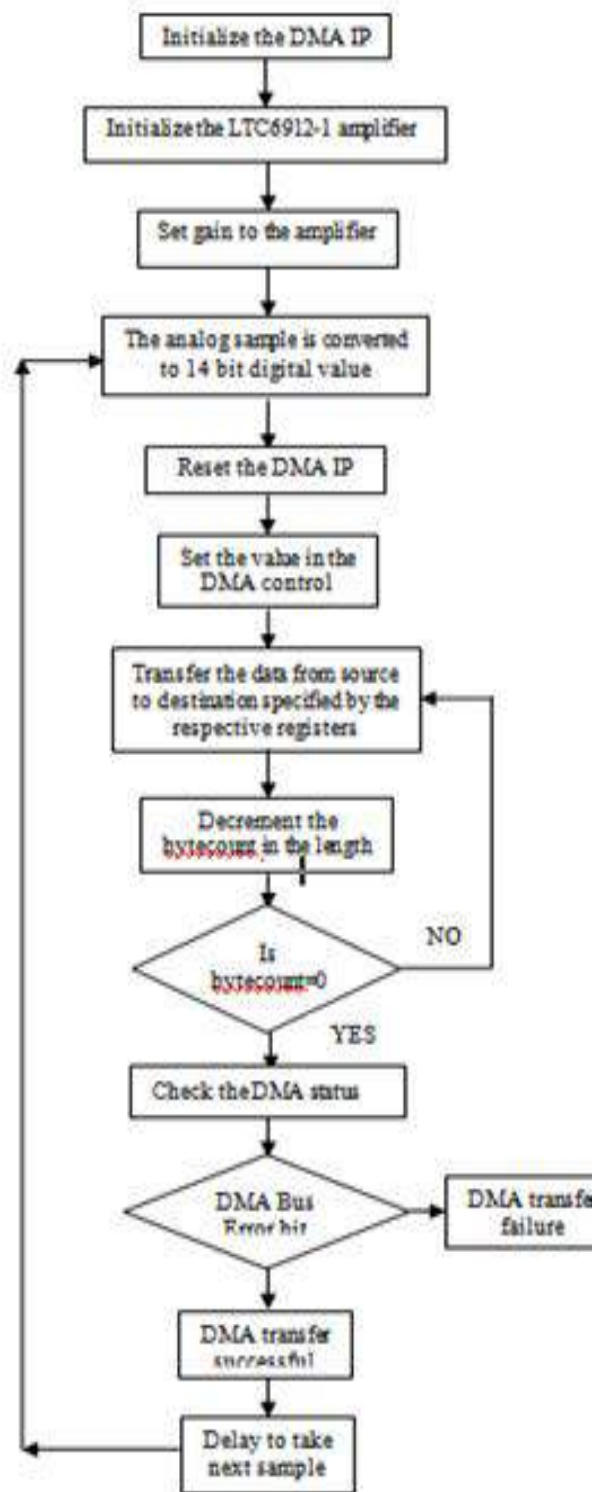
Figure 6: Flow Diagram of DMA transfer implementation [6]

The LTC1407A-1 automatically produces the corresponding 14 bit digital value to the corresponding channel of the SPI interface of LTC1407A-1. Then the digital output is send bit by bit to the memory through DMA controller in the rising edge of the SPI clock. The whole operation is depicted through a flow diagram shown in figure 35.

IV. EXPERIMENTAL SETUP SNAPSHOT

The snapshots in the figure 36 below show the experimental setup for the successful verification of data transfer through DMA controller core of a real time signal.

Fig 7: Run time verification of the design

V. EXPERIMENTAL RESULTS

The snapshot, shown in Figure 37 has been taken from the Hyper Terminal of the computer, which was connected with our FPGA device through the RS 232 serial link, this arrangement was done for verifying our design. For the verification of the operation, an analog signal of 10 KHz of pick to pick voltage 1.2 volt was taken as sample analog input signal which was connected to the input of the Analog to Digital converter via a DC blocking capacitor. Here the real time analog signal is converted by the Analog to digital converter and was sent to the memory.

In the snapshot you can see that, six columns have been printed for every bit of data transfer. The first value shows the bit position of the converted digital value. The next one shows the previous value stored in the memory address, shown in fifth column. The

third column shows the current value of the same address after the data transfer operation completed. After every bit of transfer the destination address of the memory is automatically increased. To get the proof of the DMA transfer operation DMA status register's value has been checked during the transfer operation, which showed that DMA was busy during transfer operation and no DMA bus error was occurred.
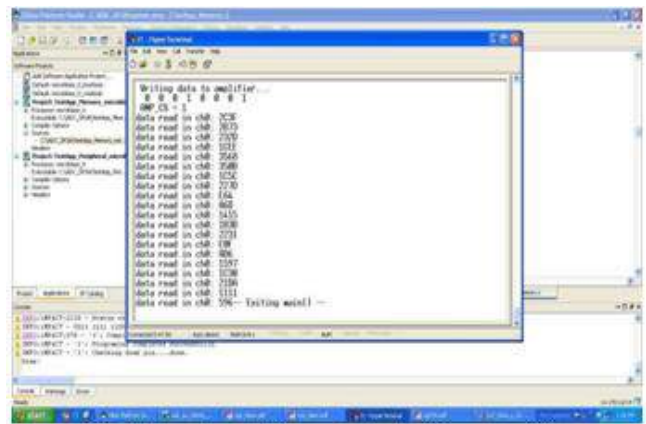
Fig 8: Experimental data view in the Hyper terminal

VI. EXPERIMENTAL SUMMARY

The power analysis shows that total dynamic power 0.17304 W and total power 0.48367 W has generated. The junction temperature was 35.8 degree Celsius. The statistics of the design and the device utilization summary of the design are shown in figure below.

Device Utilization Summary			
Logic Utilization	Used	Available	Utilization
Number of Slice Flip Flops	1,559	11,776	13%
Number of 4 input LUTs	2,269	11,776	19%
Number of occupied Slices	1,760	5,888	29%
Number of Slices containing only related logic	1,760	1,760	100%
Number of Slices containing unrelated logic	0	1,760	0%
Total Number of 4 input LUTs	2,359	11,776	20%
Number used as logic	1,876		
Number used as a route-thru	90		
Number used for Dual Port RAMs	256		
Number used as Shift registers	137		
Number of bonded IOBs	10	372	2%
IOB Flip Flops	8		
Number of BUFGMUXs	3	24	12%
Number of DCMs	1	8	12%
Number of BSCANs	1	1	100%
Number of BSCAN_SPARTAN3As	1	1	100%
Number of MULT18X18SIOs	3	20	15%
Number of RAMB16BWEs	8	20	40%
Average Fanout of Non-Clock Nets	3.56		

Fig 9: Experimental summary and run time simulation snapshots

VII. CONCLUSION

The primary goal of this work was to perform a real time data transfer between I/O and memory without the intervention of the processor core and providing a faster processing time. In future we want to perform the communication between two FPGA real time data transfer operation of audio data for voice messaging applications, where analog to digital conversion of the real time audio data is necessary and we also wish to perform the real time implementation of security protocols using FPGA processor cores.

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Timestamp and IP Address based Fraud Detection in Credit Cards using Hidden Markov Model

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ABSTRACT

Online activities mainly involve purchasing products, electronic devices and other similar things in a regular basis. There are many online transaction methods particularly made for such activities, which ensures the security by authorizing the transfer of funds. The online transactions are achieved by different bank cards that, makes the process simple. Although they are having notable advantages, they confront some of their drawbacks regarding the security. The credit card frauds can happen for many reasons, mainly to get access to non-accredited funds from the account. It is a responsibility for the bank to screen and protect the card details of the user while doing online transactions. Our approach is based on the Hidden Markov Model. HMM detects the fraud in the transactions and blocks it. It also stores the details about the timestamp and IP address of the fraudster's machine. Whenever a new transaction is made, the system will make a note of it by recording the transaction. The spending profile of the card holder is created based on his previous transaction history using HMM. Now if any intruder tries to make transactions with any registered credit card, the system notices the difference in the spending pattern of the card holder and thus the intruder gets easily trapped.

Keywords : E-Transactions, Fraud Detection, Hidden Markov Model, Credit Card

I. INTRODUCTION

The procedure of examining certain hidden patterns of data based on different outlooks in order to categorize it into useful information, which is collected from

common areas for efficient analysis of data mining algorithms in order to facilitate decision making for business and other data requirements to basically decrease costs and increase the revenue is called data mining. It is the method of discovering patterns from huge collection of data involving techniques at the junction of statistics, database systems, and machine

learning. Its aim is to withdraw data from a data set and to modify the data into a thorough structure for future use. Network security includes the policies and practices acquired for prevention and monitoring misuse, unauthorized access, alteration or refusal of a network. It includes the permission to retrieve the data which is present in a network that is controlled by an administrator Hidden Markov Model is composed of definite set of states, were each state is affiliated with a probability distribution. It is called so because only the outcome is exposed to the observer and not the states. Based on the affiliated probability distribution, a result will be generated for a particular state. Online activities mainly include

purchasing goods, electronic devices and other such things. The online transaction made for the above online activities are secure payment methods that authorize the transfer of funds. These transactions are supported by different bank cards which makes the operation easy. Apart from its impressive advantages they also have a few pitfalls regarding the security. The corrupt use of credit card is mainly done to get unauthorized funds from the account. It is thus the responsibility of the bank to safeguard the amount transferred online on the internet of the card holder. Among the various fraud detection techniques available, our approach focuses on HMM which detects the unauthorized transactions and simultaneously reports the timestamp and IP address of

the intruder's machine. Every time a new transaction made is recorded in the system. The HMM then automatically generates the spending pattern of the user. Now if any intruder tries making a transaction with any registered credit card, then its spending pattern will vary from the spending pattern of the authenticated user and can be recorded easily. The system also records the IP address and timestamp of the intruders machine so that we can easily trace his geographical location.

II. RELATED WORK

In [1], Yonghui Xiao et al. proposed a location cloaking system using the Hidden Markov Model. It is used to secure the positions of a user with distinctive confidentiality. There are two features in LocLok: it safeguards positions under sequential associations defined through hidden Markov model and it reliefs the optimum noisy position with the proportional isotropic appliance, This approach is Faster and more accurate compared to other methodologies. The standard differential confidentiality merely guards user-level confidentiality; Here the defense system needs to be imposed for a particular user. Thus the user cannot leave the system ,else there is no statistics to

safeguard. In this system the protection is enforced only for the single user.

In [2], Lutao Zheng et al. proposed a transaction fraud detection system based on the total order relation and behavior diversity, which has used behavior profile based fraud detection to detect the fraudulent transactions. It characterizes the diversity of users behavior. But it is slow detection as it has to go through a lot of user behaviours. In this paper, they proposed a method to extract users BPs based on their transaction records, which has been used to detect transaction fraud in the online shopping scenario. OM overcomes the shortcoming of Markov chain models since it characterizes the diversity of user behaviors. Experiments also illustrate the advantage of OM. The future work focuses on some machine-learning methods to automatically classify the values of transaction attributes so that the model can characterize the user's personalized behavior more precisely. In addition, they have planned to extend BP by considering other data such as user's comments.

In [3], Ishan Sohony et al. proposed a fraud detection system for credit cards using Ensemble Learning. It minimizes the misclassification that usually happens, but it is limited to only the datasets which are having numerical values. In this paper, they look at the serious and difficult task of discovering credit card fraud in a extremely twisted set. They propose an collaborative model that combines best of Random Forest and Feed Forward Networks to accurately detect fraud. An open direction of their work is improvement of accuracy parameters of the classifier. Although, the scope of their work is limited to the datasets having numerical values, yet in a more general case, for e.g., the datasets having text values it would be interesting to extend their work by including some more sophisticated techniques.

In [4], Phuong Hanh Tran et al. proposed a fraud detection system for credit cards using the approach that drives the real time data. The advantage is, it gives high-level of revealing accurateness and a

decreased negative alarm. However, it's not applicable for large stream datasets. In this paper they have proposed two approaches towards fraud detection without anomalies in the training set using maintenance vector machine with the optimal core limit selection and controller plan. Numerical results shown that it has achieved a optimal discovery exactness and a low negative alarm degree. In the future, they would like to address the fraud detection problem using auto encoder and control charts, targeting on time series data with uncertainties. They also focus on the detection ability of their proposed approach for large stream data.

In [5], Roger A. Leite et al. proposed a Visual Analytics and Event Detection system for detecting frauds related to credit cards. It performs more accurate detection compared to other existing systems at that time. But the factors like Network Analysis, New Customer Classification and different kinds of frauds have not achieved. Event detection is an im- portant in many domains like finding interesting changes that happens in stock markets, spot- ting glitches in health constraints, or spotting financial fraud. Considering these actions in a sequential setting allows the identification of perceptions such as rate, inclinations, and changes. Moreover, the investigation permits the expert to spot risks, sudden changes, or occasional occurrences. In this work they focus on the

identification of irregular happenings in the financial sector.

In [6], Andrea Dal Pozzolo et al. proposed a system for detecting frauds related to credit cards using Novel Learning Strategy and Realistic Modeling . The precision of the reported alerts is more accurate. However, the process can be long and tedious. Future work concerns the study of adaptive and possibly nonlinear aggregation methods for the classifiers trained on feedback and deferred administered models. They also expect to further increase the alert precision by implementing an approach where it learns to rank that would be specifically designed to replace the linear aggregation

of the posterior probabilities. In their experiments, they exhibit the impression of class disturbance and theory implication in a information stream containing millions of transactions over a time of three years.

In [7], Alexander Artikis et al. proposed a prototype for a system which manages credit card frauds. The system uses Online learning settings, Logic programming and answer set programming. Advantage of this system is that it efficiently adapts to the continuously changing fraud types. But the consumption of time is high and has to be performed on huge datasets for it to be effective. They recommended a approach, and established a model for preemptive event-driven planning. The machine learning section maintenance the online production of fraud configurations, permitting it to capably familiarize to the continuously growing fraud types. Also, the user interface of the model allows fraud specialists to make the most of the outcomes of computerization (complex event processing) and thus grasp informed decisions. The valuation of the modules is based on characteristic operation datasets, permitting for a accurate evaluation.

In [8], Jan Henrik Ziegeldorf et al. proposed a system for preserving privarcy using HMM Forward Computation. The system uses Privacy-Preserving HMM Forward Computation. Areas like bioinformatics, recognition of patterns, and signal processing, Hidden Markov Models have grown into an essential algebraic tool. A fundamental construction for this framework is the advancing algorithm which calculates the Likely hood to notice a specified arrangement of productions for a given HMM. The

classical Forward procedure needs that one party holds both the model and remarkable arrangements. They observe for many emerging applications and services that the models and observation sequences are held by different parties who are not able to share their information due to applicable data protection legislation or due to concerns over intellectual property and privacy. In this paper, they

show how to resolve the evident conflicts using protected two-party calculation. Concretely, they suggest Priward which enables two equally untrusting events to calculate the Forward algorithm steadily, i.e., without demanding either events to share their sensitive ideas with the other or any third event. It is less expensive. Although It's less expensive, it drains the battery of a mobile user.

In [9], Zheng-Guang Wu et al. proposed passivity asynchronous control model based on passivity for the Markov Jump Systems. The desired asynchronous controller can be resolved easily by available LMI Toolbox here. However, the mode of information is not fully available to the controller/ filter at every instant. Here they learn the difficult of inactive asynchronous mechanism Markov jump systems for distinct time. Therefore, the resulting loop system that is secure is named as the hidden Markov jump system. By using the matrix variance method, three equal sufficient circumstances are projected to confirm the stochastic indifference of the hidden Markov jump systems. In reference to the recognized circumstances, the structure of asynchronous controller which shields synchronous controller and mode-free controller as distinct circumstances is addressed. A statistical example is specified to prove the effectiveness of the resulting outcomes.

In [10], Kang Fu et al. proposed the Convolutional Neural Networks method for detection of credit card frauds. The most relevant attributes would reduce the processing time and hence such attributes need to be considered . But the accuracy of fraud detection is low. In this section, they firstly provide a description of fraud detection framework based on CNN. Secondly, they have proposed a feature of novel trading. Thirdly, there is an elaboration of sampling method that is cost based. At the end, the problem of frauds related to credit cards is solved by employing the CNN model. This method has found its base from the many different types of methods taken into account before.

In [11], Nader Mahmoudi and Ekrem Duman proposed a system for detecting credit card frauds

using the Modified Fisher Discriminant Analysis. Its performance is best in terms of maximizing the total profit. The number of fraudulent transactions that can be captured by this system can be increased.In this paper, details of investigation using the Fisher Discriminant Analysis technique. Evaluation of the model is done by calculating the total saving amount. This amount is calculated for every case in question. To obtain a thorough view of the execution of the lodged methods, three other methods such as FDA and the Modified FDA technique (MFDA) on datasets including ANN, DT and NB are applied.

In [12], Ivo Correiaet et al. proposed proposed a system for detecting credit card frauds. It uses Event Processing Network in its implementation. It detects the potential fraud incidents that take place in real-time, so that the corrective actions can be taken. The inclusion of uncertainty aspects affects all levels of the architecture and logic of an event processing engine. Proactive Technology Online implements the extensions that include operands of new types , in addition with new built-in functions and attributes, and support for event processing patterns to cope with all these. These new capabilities were enforced as building items and were used as basic primitives within the complicated programmatic language for event processing. Their preliminary results show potential benefits that come from including uncertainty features to the task of detecting credit card frauds.

In [13], Gabriel Preti Santiago et al. proposed an approach in modeling for detection of frauds done using credit cards during payments through electronic services. The system implements Modelling and Classification approach as its methodology. Detects most of the difficult frauds which were not detected by the existing procedures in the company. However, the seller entity of the model was not considered in the experiment as it had a peculiar behavior. There is a rise in the amount of electronic transactions being done over the internet in the recent years, which is mainly due to the significant growth in e-commerce. This scenario makes the frauds in electronic transactions a matter

of high importance. They present a system to solve this problem, using the history of the transactions

and then extract the features to classify and predict if the transaction is a fraudulent transaction or not.

In [14], Ashphak Khan et al. proposed a system to get the observation probabilities in HMM for detecting frauds related to credit cards. It also explains how the HMM detects whether a transaction being performed is fraud or not. The transaction amounts are divided into

3 groups i.e, high, medium and low. In HMM strategies are incredibly low compared to other techniques used for detecting frauds. It has been explained that the HMM can identify whether a transaction done is fraud or not. It is very robust, highly effective and scalable. Correctness and Effectiveness of the prediction to certain datasets can be expanded. In this paper, they have implemented HMM for detecting credit card frauds. The system is scalable large volumes of transactions can be dealt.

In [15], Nitin Rakesh and Ankit Mundra proposed an approach for online fraud detection and prevention which is done using the technique of Online Hybrid Model. OHM approach has been implemented in : theft of identity, fraud in online auction or fraud using card theft and non- delivery/merchandise fraud. OHM is also effective in detecting many other frauds like counterfeit card fraud, spam/spin fraud, etc. Thus, OHM is an extremely effective and robust outlook for online fraud detection and prevention. It is robust but it is slow and gives less accurate estimation compared to other systems.

III. METHODOLOGY

In this phase the amount of each transaction is collected in a loop. For every new transaction, the difference in the amount with of the recent transaction and the previous 10 transaction of the particular user is computed. The difference observed is compared with the threshold value set. If the

current value is higher than the threshold value, then it is considered to be fraudulent.

The basic architecture of the operations performed is shown in the Figure 1. The buyer visits the website, purchases the item and does the online payment. This payment is them checked to see if it is done by the valid user or a fraudster.
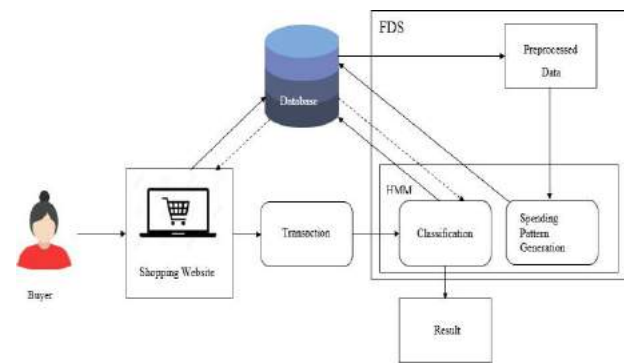
Figure 1: Architecture Diagram for Fraud Detection

For each transaction the user credentials such as username and password and card details such as card number, cvv, expiry year and month are also validated before the particular transaction is being processed. We have also considered the IP address of the system. It is recorded for each transaction. Once a system's IP Address is considered as fraud then it blocks the transactions from that particular IP Address. The number of daily transactions is also limited to 3 transactions.

If a genuine user does the transaction which is above the set threshold value, then the registered number receives a OTP using which the transaction can be processed. System logs out and gets itself blocked the moment any suspicious transaction is detected.

The algorithm takes the transaction of the user as input, undergoes various operations and based on the result of these computations it classifies the transaction into genuine and fraud. The genuine transactions are processes and fraudulent once are blocked as shown in Figure 2.

ALGORITHM:

Input: Transactions of the user.

Output: Transaction classified into genuine and fraud.

1. Start.
2. Set the initial probability values
3. For every new transaction
   3.1. Traverse through previous 10 transaction of the user
   3.2. Compute the difference in the amount
4. Compare the difference value with the predefined value.
5. Validate the user and the card details.
6. Check for the IP Address in the Fraud List.
7. Classify into Fraud and Genuine transactions.
   7.1. If amount is within the threshold value and all conditions are true then process the transaction as genuine.
   7.2. If amount is greater the threshold value and all conditions are true then send a otp for verification.
   7.3. If any of the conditions is not satisfied or a wrong otp is entered then then transaction is labelled as fraud.
8. If the transaction is genuine process it and if it is detected as fraud then block it.
9. Stop.

Figure 2: Algorithm for Fraud Detection System

IV. EVALUATION

The experimental results revolve around the number of losses incurred. We propose the application of HMM in detecting the credit card frauds thereby recording the IP of the fraud system along with the timestamp. It is dependent on limit of the credit card which varies with the user.

In our system, we have proposed the use of Hidden Markov Model in detecting the frauds in credit cards thereby recording the IP of the fraud system along with the time stamp when malignant attempted to attack. The model generates a spending profile of the user for given sequence. The difference in the amounts of the previous and new transaction sequence is compared with the threshold value which is used to decide if the current transaction is a fraud or not. Initially the rate of financial loss due to frauds done using credit cards was high. After the implementation of the system for fraud detection using HMM, the rate of loss is decreased. The percentage of detection of frauds is increased to a great extent.

V. CONCLUSION

In our system we have proposed the application of Hidden Markov Model for detecting the frauds done using credit cards and also record the IP address of the fraud system along with the timestamp when the fraud was done. It can be useful in tracing the geographic location of the attacker. The model also generates the spending profile of the user. The change in the amount of previous and new transaction sequence is compared with the threshold value which decides whether the upcoming transaction is fraudulent or not. In our simulation model we have taken a small set of data, but our proposed system can handle larger range of transactions that is quite certain in real life scenarios. The current system that is developed is a simulation model for detecting fraud during online credit card transaction. In future the system can be used to detect frauds in real time. Specific banks can be taken in confidence for detecting frauds for bank specific cards. The system can be expanded to detect other type fraud transaction such one done using debit cards.

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Mental Health Analysis using Natural Language Processing

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ABSTRACT

Our increasingly digital life provides a wealth of data about our behavior, beliefs, mood, and well-being. This data provides some insight into the lives of patients outside the healthcare setting, and in aggregate can be insightful for the person's mental health and emotional crisis. Here, we introduce this community to some of the recent advancement in using natural language processing and machine learning to provide insight into mental health of both individuals and populations. We advocate using these linguistic signals as a supplement to those that are collected in the health care system, filling in some of the so-called "whitespace" between visits. Whitespace information provides a lens through which we can analyze psychological phenomena like emotional crisis, suicide attempts, and drug relapse.

Keywords : Natural Language Processing; Machine Learning, Mental Health, Whitespace; Psychology;

I. INTRODUCTION

Mental illness causes strain on human race at a very large scale physically, emotionally and financially. When Compared to other physical illness there is very less understanding about mental illness and ailments using natural language processing. The most important point of this issue is emotional crisis for example say the loss of sobriety (the state of being sober) or attempting suicide. These type of behaviors cause a high emotionally and financially troll and ill understood. Interactions with the health care systems will help to know more about emotional crisis and from where mental health comes from. As technology has taken a major part in our lives (by smart phones, smart devices, IOT devices etc.). We can easily analyze the behavior and mental illness of individual.

II. NATURAL LANGUAGE PROCESSING

The study of this paper highlight the work relevant to the personalization, idiosyncratic, prevention and scalable measure of the whitespace to the mentally affected community. The major cause of disability around the globe is depression. If depression is not treated at early stage it might lead to drug or alcohol addiction or other risks such as suicide. Rather then psychiatric specialist the person usually idealize hisself or might consult to the primary care physicians. Surveys say that depression has lead to more than the 91% people to spoil there self or commit suicide. With growth of social media large number data is shared by users voluntarily expressing their feelings, moods, and struggles and their daily problems with a mental health on various social media platform. This will helps other user to understand the communities. whenever any user post any such depressed thoughts it makes easy for studying the person behavior by

using natural language processing or unsupervised or supervised learning.

We collect the data from the various social media platforms and apply cross-sectional design to test the hypothesis that machine learning algorithms can classify suicide notes as well as or better than practicing mental health professionals and psychiatry physician trainees.

The 7 steps to extract information using NLP technique are as follows:

STEP 1: The Basics

The input to NLP will be a simple stream of Unicode characters (typically UTF-8). Then processing will be required to convert given character stream into a sequence of lexical items (as in words, phrases, and syntactic markers) which can then be used to better understand the content.

The basics include:

1. Structure extraction – To identify fields and blocks of content based on tagging. Identify and mark sentence, phrase, and paragraph boundaries

2. Language identification – This is to detect the human language for sentence or for each paragraph and for the entire document. Language detectors are critical to determine what linguistic algorithms and dictionaries to apply to the text.

3. Tokenization – To split character streams into tokens which is used for further processing and understanding. Tokens can be words, numbers, identifiers or punctuation (depending on the use case)

4. Acronym normalization and tagging – Acronyms can be specified as "I.B.M." or "IBM" so these should be tagged and normalized.

5. Lemmatization / Stemming – Reduces word variations to simpler forms that may help increase the coverage of NLP utilities.

6. De-compounding – For some languages (typically Germanic, Scandinavian, and Cyrillic languages), compound words are split into smaller parts so that we get accurate NLP.

7. Entity extraction – e.g. people, places, companies, etc.

1. Regex extraction – e.g. SSN, driver's licenses, etc.

2. Dictionary extraction – e.g. colors, units, sizes, employees, business groups, drug names, products, brands, and so on.

3. Complex pattern-based extraction – e.g. extract an item based on its context.

4. Statistical extraction – e.g. academic or journalistic text.

5. Phrase extraction – e.g. "Big Data" has a strong meaning which is independent of the words "big" and "data" when used separately.

STEP 2: Decide on Macro versus Micro Understanding

Macro Understanding – provides a general understanding of the document as a whole. Typically performed with statistical techniques. It is used for: clustering, categorization, similarity, topic analysis, word clouds, and summarization.

Micro Understanding – extracts understanding from each phrases or sentences. Typically performed with NLP techniques it is used for: extracting facts, entities (see above), entity relationships, actions, and metadata fields.

STEP 3: Project feasibility

Not all natural language understanding (NLP) projects are possible within a reasonable cost and time. After having done numerous NLP projects. Everything should be properly planned and understanding RAID is an important aspect.

STEP 4: Macro Understanding

To understand the below mention records we need a complete understanding of whole document.

1. Classifying / categorizing / organizing records
2. Clustering records
3. Extracting topics

4. General sentiment analysis

Record similarity, including finding similarities between different types of records. For instance:

1. Job descriptions to résumés / CVs
2. Keyword / key phrase extraction
3. Duplicate and near-duplicate detection
4. Summarization / key sentence extraction

STEP 5: Micro Understanding

Micro understanding is the extracting of individual entities, facts or relationships from the text.

There are three approaches that is used to perform extraction that provides micro understanding:

1. Top Down – Determine Part of Speech, then understand and extract the sentence into clauses, nouns, verbs, object and subject, modifying adjectives and adverbs, etc., then traverse this structure to identify structures of interest.

Advantages – This can handle complex, never-seen-before structures and patterns.

Disadvantages – It's hard to construct rules, brittle, often fails with variant input, and may still require substantial pattern matching even after parsing.

2. Bottoms Up – Create lots of patterns, then match the patterns to the text and extract the necessary facts. Patterns may be manually entered or may be computed using text mining.

Advantages – Easy to create patterns, it can be done by business users, does not require programming, easy to debug and fix, run, matches directly to desired outputs.

Disadvantages – Requires on-going pattern maintenance, cannot match on newly invented constructs.

3. Statistical – Similar to bottoms-up, but matches patterns against a statistically weighted database of patterns that is generated from tagged training data.

Advantages – Patterns are created automatically, built-in statistical trade-offs.

Disadvantages – requires generating extensive training, data has to be periodically retrained for best accuracy, cannot match on newly invented constructs, harder to debug.

STEP 6: Maintain Attribution

In accommodating the data from the internet and going through the content by extracting it involves several steps in it and it also has to pass across various stages. It is always more important to include tracing through the data for all the outputs generated so that the backtracking process also goes well through we can identify how the information is generated and where did it come from.

This usually involves:

1. Saving of the web pages which has the data concerned.
2. Saving the first and the last letter positions of the blocks of data from web site.
3. Savind the first and last letter positions of all elements, and the element id and the element type must be matched.
4. Even Identifying, normalization functions are put to the data content.

STEP 7: Human Supportive Process

Every process can't be done by itself untill human activity is involved in it. We always have to note that human intervention is need for following:

1. For generating or purging or picking lists of known elements.
2. For generating results accuracy
3. In discovering new outlines.
4. To estimate and correct results obtained
5. In creating training information

Most of all these processes can be frequent repeatedly. In a huge scale systems, we need to take human elements into picture and map it with the natural language processing system models. All the content obtained is been build as per the natural language processes and linked with the real time activities.

III. CONCLUSION

Various problems faced in the society like mental tension, drug addiction, distress, suicide attempts and many more can be removed by taking social media into centre. . Which can come accordance with the person's behaviour. This can be achieved by bring

natural language processing into picture. Here the various methods that can resolve the content into understandable format is given and through the past history and other technique its determined.

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WeVote – Secure voting using Blockchain

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ABSTRACT

The blockchain technology has been showing promising application opportunities since its beginnings. Blockchain was introduced to many areas from the original cryptocurrency to the present smart contract. By examining famous blockchain schemes, we perform a systematic study of the safety threats to blockchain and how this blockchain concept can be applied to the current voting system in India. We also review this blockchain voting system's safety and stability against fraud. We also propose some future directions for stimulating study attempts in this field.

Keywords : Blockchain, Voting, Distributed ledger, Security and Database.

I. INTRODUCTION

Indian elections are performed almost solely using electronic voting machines created by a couple of government-owned companies over the previous two centuries. These systems, known as EVMs in India, have been commended for their easy design, ease of use, and reliability, but have also been criticized lately following extensive election irregularities reports. Despite this criticism [1], many details of the design of the devices have never been revealed openly, nor have they been subjected to a strict, autonomous safety assessment. Here we try to propose a system where the Indian voting system can be integrated with the blockchain technology to provide safer and risk-free voting [2], [3]. We define the design and operation of the machine in detail, and we assess its safety in the light of the appropriate processes for election. We conclude that they are susceptible to severe assaults that can change election results and breach the secrecy of the ballot despite the simplicity of the computers and minimal

software trusted computing base and the same can be overcome by the integration with blockchain [4]. A blockchain is essentially a distributed record database, or a public ledger of all transactions or digital events executed and shared between participating parties [5]. Each government ledger transaction is confirmed by agreement of a majority of system respondents. Once entered, it is never possible to erase data. The blockchain includes a certain and verifiable record of each transaction that has ever been produced [6]. The most common instance of using blockchain technology is Bitcoin, the decentralized peer-to-peer digital currency [7]. The digital currency bitcoin itself is extremely contentious, but the underlying blockchain technology worked flawlessly and discovered a broad variety of applications in both the economic [8] and non-financial world [9]. The integration of Indian voting system with blockchain paves way towards secure voting in India. Blockchain makes sure that once the vote has been registered, the data cannot be tampered with in any manner. The primary

hypothesis is that in the digital internet globe, the blockchain is setting up a scheme to create a distributed consensus. This enables participating organizations to understand for certain that, by generating an irrefutable record in a government ledger, a digital incident occurred. It opens the door to the development of a centralized, open and scalable, democratic digital economy.

II. EXISTING SYSTEM

Voting in India is conducted by electronic voting machines or EVM, which was first introduced in 1982 [10]. More than 2.3 million EVMs will be used in 2019 elections as compared with 1.8 million ones in 2014.To check for foul play, vehicles transporting the EVMs will be fitted with GPS devices to monitor their movements. The EVMs allows vote counting to be completed in up to three hours compared with manual counting, which could take 30 to 40 hours. The electoral body also uses digital cameras, videotaping of speeches and the use of wireless networks during the election process. In the current elections, Voter Verifiable Paper Audit Trail (VVPAT) machines will be used along with EVMs at all polling stations after opposition parties questioned the EVMs' accuracy. The VVPAT [11] allows the voter to cross-check the votes. "Ever since EVMs were introduced in 1982, they have been questioned and challenged, but they have stood judicial scrutiny and they stood the test of time," Quraishi, the former electoral body chief said.

III. PROPOSED SYSTEM

The proposed system applies block-chain technology to distinguish the current dataset with the original one and hence identify any type of alteration or fraudulent activity performed. The original dataset is what is collected at the time of elections, which is basically the collection of details of each and every vote that was casted by the voters. The information includes the voter's information and the candidate to which he/she had voted for. This information which is stored in this database is directly sent to the administrator (in case of elections, the administrator can be the election commission) and then it acts as a master table and can be used as a reference material to discover whether there has been any sort of modification to the data that is received later on through the polling booths.

The interface is provided is a web based platform that consists of two halves, one for the administration and the other for the voters. The administrator is able to put together the list of the eligible candidates, they also have the authority to cross verify each registered voter. On the other hand the votes can register themselves for each elections through their Aadhar number and a couple of other details as well as cast votes that will then be securely stored through the help of blockchain.

A. Advantages:

· Provides easy registration for voters.
· Being a total software solution, it does not allow maintenance factor to be considered much.
· The accuracy level of actual vote distribution would be high as compared to hardware-based solutions (EVMs).
· Successful detection of any type of unwanted modification.
· Record of total candidates and votes casted can be easily maintained.
· Unlike EVMs that can only record a maximum of 2000 votes per machine [12], the proposed system can take as many votes as possible.
· It will allow to conduct a much more fair electoral process.
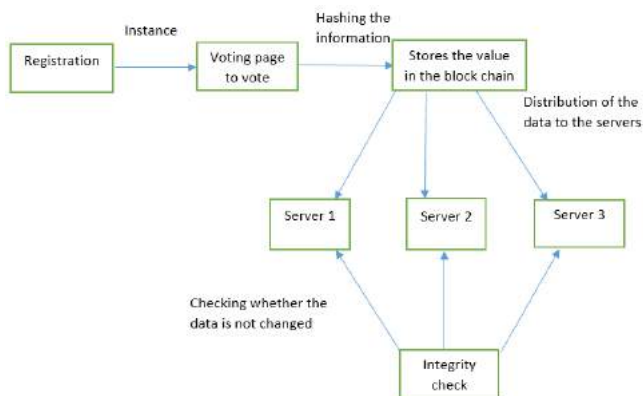
Fig. 1 System Architecture.

IV. IMPLEMENTATION

The project WeVote is implemented using the technical stack. The components of this stack are MongoDB, ExpressJS, and NodeJs. MongoDB is used to store the details of the voter and candidate. Since the database is a non-structural database, so it is easy to extend the fields of the database and add different types of data. The data is stored in JSON format which helps in retrieving and displaying the data as the project is a web-based project which makes the thing easier.

MongoDB is well known for its scalability and as well s flexibility and as to make sure the application can be used for future use and many parameters can be included as the day passes many parameters can be introduced where the scalability of the MongoDB comes into the picture where we can change the documents.

As the application is a web-based application, we tried to use NodeJS to make the connection between the database and the front-end. When compared to the python NodeJS is much more faster, as on the day of voting many people would try to access the website and the request made to the server by the people who are voting will be behemoth and the server can't give a quick and accurate response, so NodeJS is used instead of python.

We have designed a class for a particular voter where we store his personal information and this detail will be checked to make sure that the person giving the details is the actual person by the admin.

And also, we have made two step authentications using Aadhar number. So as to check fraud and decrease the amount of people who cast extra votes by providing invalid information.

Then when a person casts a vote, his voter registration number along with is Aadhar number will be hashed and added to the block chain and this block chain will be distributed every time a person votes to a dedicated server which has the chain of votes and if someone tries to access the information and tries to change the information of the voting details, the person can only change the details of that particular server and the administrator has the authority to check the integrity of the files in each server, thereby coming to know whether the files are changed are not.

ExpressJS is a framework for NodeJS which makes the routing of requests from clients to route much easier and helps in faster development of the application. The given application uses this technology stack to develop the application.

V. CONCLUSION

Since the inception of the concept of blockchain, it has been related to crypto currency and not been widely used for other applications in different fields. The proposed program titled WeVote is a blockchain-based e-Voting system that could help take a step forward towards a more secure and fair electoral process. It takes advantage of the security features of blockchain to provide a more trusted platform to conduct the voting process. What we have presented is a prototype that implements the general idea of blockchain through a web-based platform. It enables the casting of votes and stores that data in a form that if altered with, can be detected with ease hence avoiding any fraudulent activities that might usually take place. The system mainly aims at removing hacked voter registration databases and EVMs. The voters, therefore, have a more reliable source which makes sure that their choices are properly recorded and goes to the intended candidates only. Another beneficiary of the

proposed system is the Election Commission, it gets the data directly from the voters and does not have to go through a rigorous process of validation to make sure of the integrity of the data.

The proposed solution can help to transform the current voting system from physical records of data to a much more secure and efficient version based on blockchain technology. In the future, we plan to test this out in a small real-life environment that includes actual voters, candidates and a committee to monitor the whole operation. A small example could be electing prefects to form student unions in schools. After successfully verifying the use cases we further plan to bring the system on a mobile platform to enable the voters living overseas or remote locations to take part in the elections on the go. There can be more improvements made after the system is made available on mobile, for instance, voter registration can be done through a facial recognition system. Then the user data and the votes can be kept in a cloud-based storage facility, and later each voter can be verified through their voter IDs as well as their facial data that can be compared through image processing.

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Big Data in Telecommunication

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ABSTRACT

Big data offers telecom business a genuine chance to pick up a substantially more complete image of their tasks and their clients, and to advance their development efforts. Big Data requests of each industry an altogether different and flighty way to deal with business improvement. Telecommunications associations that can consolidate these new methodologies of learning buyer need into their hierarchical procedures will pick up a more upper hand than their partners who adhere to the conventional strategies for learning the market prerequisites.

Keywords : BigData, Telecom, Churn Prediction

I. INTRODUCTION

We are advancing towards a time of data which can and should be changed, to empower the organizations react progressively to social changes in the client attitude or to quickly react to dangers from the market rivalry. This is actually where the Big Data and its examination can win the fight against the customary BI tools.

Meanwhile, Telecom companies are unaware about the volume of data which could, on proper analysis can get deeper insights into customer behavior, preferences, interests and their service usage patterns. This is what Big Data is for Telco's [1].

With the expanding selection of cell phones and development in versatile web, Telco's today approach to outstanding measures of information sources including – customer profiles, device data, network data, customer usage patterns, location data, apps downloaded. This information consolidated together turns into the Big Data.

Most operators conduct analytic programs which empower them to utilize their inside information and lift the productivity of their systems and drive benefit with some achievement. The capability of enormous information additionally accompanies an alternate test of consolidating bigger measures of data in order to build incomes and benefits over the whole telecom value chain - from network operations to product development to marketing, sales, and customer service.

Telcos today are refining and streamlining the client experience which is a vital aspect for supporting a market separation and lessening agitate. Telcos are utilizing Hadoop and enormous information investigation to pick up a genuine 360-degree perspective on their clients alongside their lifecycle. Basis the detailed customer profiles, Telcos would then focus on small scale segmentation of their buyer base, offer a convincing client experience, create customized offer recommendations. Few examples are:

- Targeted marketing
- Predictive churn
- Customer Lifecycle
- Proactive Support

II. TELECOMMUNICATION ANALYTICS

The Telecommunication business worldwide is ending up in a profoundly unpredictable condition of diminishing edges and blocked systems; a situation that is as ferocious as ever. In an offer to endure and have an edge over their rivals, tele organizations have started to grasp big data. Another examination on how Telecommunication is utilizing big data demonstrates that 85% of the respondents show that the utilization of data and investigation is making an upper hand for them. big data activities guarantee to improve development and increment productivity and gainfulness over the whole Telecommunication worth chain. It can improve the nature of administration and directing traffic all the more adequately. By breaking down call data records continuously, tele organizations can distinguish false conduct and follow up on them right away. The showcasing division can tailor its battles to more readily focus on its clients and use bits of knowledge picked up to grow new items and administrations [5]. A normal Telecommunication administrator produces billions of records for each day. Utilizing this data progressively, media communications organizations can improve their business and client commitment models. Nothing occurs in a vacuum. Preceding big - data examination, advancements, for example, data warehousing, online analytical processing (OLAP), and data mining is received by Telecommunications bearers to improve operational proficiency and client experience. To value that, it sees how a Telecommunications system is overseen. It contains three flat layers asset, administration, and client, crossing crosswise over two vertical points of view foundation and item and tasks [2].

The resource layer incorporates exercises identified with the system work out, arranging, and checking. Administrators continually screen the presentation of the systems (counting client gadgets and system gadgets, for example, switches, routers, base stations, and so forth.) to guarantee smooth activity. data gathered at this layer incorporate alerts produced by the system gadgets and key execution pointers (KPIs) for example, packet loss ratio, latency, traffic load, and so on. data sets support use cases for network planning, capacity management, also, fault toleration [2].

The service layer incorporates exercises identified with provisioning of client administrations (voice, data, and video). It additionally underpins proactive observing and receptive diagnostics required by administration level agreements a legally binding agreement between the administrator and the clients on the performance and accessibility of the bought in services. History logs from administration provisioning can be utilized to improve the ordering procedure, shortening the time from requesting to income. Usage pattern data can be mined to detect frauds or monetized by selling to companies that are interested in reaching out to potential customers [3].

At the customer layer, the fundamental assignment is Customer relationship management (CRM), which handles the customer asks, orders, inconvenience tickets, and guarantee client fulfilment. The administrators may prescribe items or administrations to the client's dependent on, e.g., area, gadget, use, or perusing history. Churn analysis predicts the likelihood that a client may end the administration and gives bits of knowledge on why the clients are leaving. Proactive customer care resolves issue the clients may experience before they even know it by always monitoring the client's quality of experience [3].
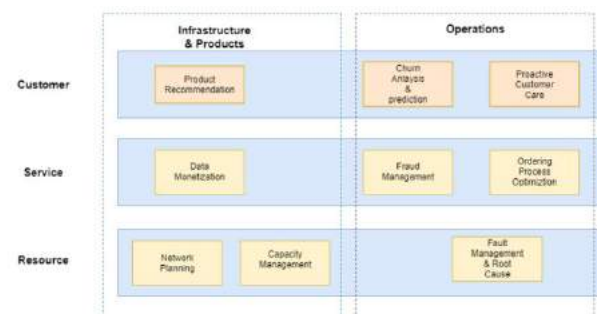
Fig.2: Telecommunication bigdata analytics Framework

III. BIG DATA CHALLENGES IN TELECOMMUNICATION

As the number of end to end devices and media applications is growing, the wired and remote systems and the hubs not just have enough difficulties in managing with signaling and the information from these devices to help the standard administrations.

The measure of Data that should be stored and analyzed by system services is developing exponentially and the complexity of such analysis is moreover winding up incredibly challenging [4].

Telecommunications organize components (for instance, MME(Mobility Management Entity)or SGW(Cisco Serving Gateway) or PGW(Cisco Packet Data Network Gateway) in a 4G LTE system) in a typical deployment arrangement of hundred to numerous hundred cells and a couple of thousands of supporters will produce log Data, to help with investigating the framework .

These Telecommunications organize components, as an aggregate, can produce a large number of MBs to GBs of Data every hour. A considerable lot of the occasions, this Data will be spilled to servers in network operations centre for life and post-processing [4]. Anybody working in the Telecommunications business would disclose to you that the capital use request because of data development is their greatest test starting at yet. This issue emerges because of changing patterns in the utilization of Data benefits over voice administrations. For example, rather than making calls and messaging individuals lean toward WhatsApp and Skype, driving the development in data traffic and transfer speed utilization. To oblige such requests, Telecommunications administrators need to put massively in the framework and furthermore take a stab at cost productivity. The administrators ought to likewise put resources into a framework to encourage enormous Data investigation [8].

IV. NETWORK ANALYSIS

System checking items convey a motive to players in the Telecommunications business by gathering data from the system, examining it, and exhibiting significant experiences to the Network Manager. It upgrades the system, reduces downtime, and improve general effectiveness. To grasp Big Data advances, many system administrators are applying progressed investigation to arrange data to acquire important bits of knowledge. The most remarkable Big data challenges in doing as such include the procedure and political issues in sharing data productively with important partners and managing uncooperative merchants [8].

V. DATA STORAGE SERVICES

The worldwide one of a kind subscriber base in the Telecommunications business was near 5 million supporters in the year 2016 as of now. The developing number of 3G and 4G membership will just add to the measure of substance and client data created throughout the following couple of years. As the measure of data created develops exponentially, players in the Telecommunications business will confront Big Data challenges as far as putting away this data. Furthermore, organizations should take a look at automated Data migration procedures and layered stockpiling Data the executives to bring down the expense of taking care everything being equal. Data stockpiling was one of the top enormous data challenges in the Telecommunications business as the data vault continues developing once a day.[8]

VI. DOMAIN AND USE CASES

These should make up the future advanced local Telecommunication, on both the front and back finishes. In recognizing use cases, administrators should think both expansively and for all intents and purposes. An extensive view crosswise over spaces (for instance, crosswise over deals, promoting, tasks, and back-office) is required to distinguish the full index of computerized and-investigation use cases. In any case, although the possible objective is

association-wide change, administrators likewise should be down to earth and concentrate first on snappy successes to gather relentless speed and inevitable scale. With advertising and deals, for instance, an occupant Western European Telecommunication goal was to adapt its current base further while reacting to aggressive dangers. It built up a mechanized and focused on client life-cycle-the executives crusade that prompted a 5 percent increment. Clients got offers inside 30 minutes of a trigger occasion, for example, utilizing a lot of Data to stream a live video or visiting a store to get an issue with a handset settled[10].

Media transmission industry is the one pulling in nearly the most critical number of clients consistently is a huge field for deceitful action. The most across the board instances of misrepresentation in the Telecommunication zone are illicit access, approval, burglary or phony profiles, cloning, conduct extortion, and so forth. Extortion affects the relationship built up between the organization and the client. [11]
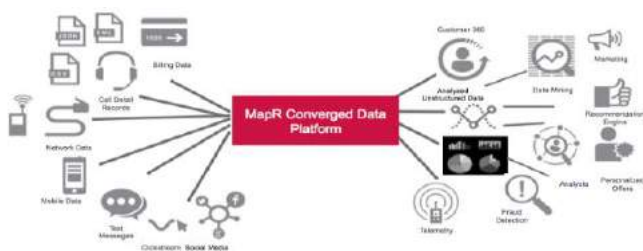
Figure 2 Data-Driven Improvement of Services or Product

VII. CONCLUSION

The applications of big data analysis are rapidly growing and furthermore increasing in the department of Customer Relationship Management. The telecommunications sector holds the potential to contribute largely to this as the telecom networks generate a large amount of data in varying domains like networks, applications, call processing and many more.

This data being produced in large amounts by customers on a daily basis, if analyzed with proper tools and measures can offer insights which can

prove to be extremely valuable in order to improve customer relations and reduce customer churn thereby providing a huge boost in terms of revenue. Telecommunication companies are now making use of big data in order to:

· Improve network and services provided.
· Forecast and prepare the networks for the upcoming demands much faster.
· Recognize the potential of any new product or service being launched.
· Reveal areas which are in need of improvement.
· Understand customer experience and provide better services accordingly.

Since the customers tend to leave their digital footprints across the global network there is a lot of data that can be churned into useful insights and converted to meaningful consumption form, thus leading into better decision making process, also it can help identify issues and resolve root causes at the very early stages. The insights obtained from these datasets can be used in several different ways, it can enable the customer calling centers to answer the concerns and solve any arising issue faced by the user in a much more efficient manner. Furthermore, the analyzed data can help to create customized calling and data plans for the customer. A detailed report on call drops in specific places can be generated which can help identify network failures and hence come up with solutions to prevent such disruptions in the future and on top of that it can be used to provide location-based services.

Churn prediction, that is the forecasting of customers who are at the risk of leaving a company. This is related to customer retention which is a huge challenge in the telecommunication industry as gaining new customers is much more expensive than retaining the old ones, this is another area where big data analytics can help.

By putting together data based on customer usage, complaints recorded, transactions etc. and processing all of it with predictive models it is possible to pick out the customers who are most likely to leave. Furthermore, customer segmentation is another

process that can improved with the help of big data analytics, the telecom companies can identify customers with high probable lifetime value to plan targeted marketing and retention methods to reduce churn rates along with creating tailored products according to customer needs. While it can also help to organize and deploy predictive campaigns in order to identify new customers.

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A Review on Emotional Intelligence

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ABSTRACT

This paper reports the review on the emotional intelligence, its components, techniques and applications. EQ can be defined as one's ability to diagnose, regulate, assess, analyze and express emotions. An individual with high EQ can be a smart leader, great team player, incredible motivator and an innovative person. EI will lead to better decision-making capabilities, strong personal and social relationship, increased team performance and leadership, and finally, reduce destructive behavior which in turn promotes universal peace.

I. INTRODUCTION

Based on many proven case studies first benchers or high IQ societies fail to lead a successful life because of lack of emotional intelligence. Here's where we find the need for emotional intelligence to find its importance. Intelligence is classified into two categories as Logical intelligence and Emotional intelligence which are measured by Intelligent Quotient (IQ) and Emotional Quotient (EQ) respectively. The burgeoning growth in the field of Artificial Intelligence (AI) initially powered by IQ alone has now led to a rise in Emotional Intelligence (EI) as well.

Fig.1: Balance of IQ and EQ

WHAT IS EMOTIONAL INTELLIGENCE?

In today's scenario, we tend to judge people on their marks, percentiles, and percentages on an academic perspective. But have you ever thought of one's marks on emotional stability, creative thinking, problem-solving skills, and out-of-box thinking? Research is constantly proving that judging a person on IQ or EQ alone as always been a failure. EQ can be defined as one's ability to diagnose, regulate, assess, analyze and express emotions. An individual with high EQ can be a smart leader, great team player, incredible motivator and an innovative person.

II. COMPONENTS OF EMOTIONAL INTELLIGENCE

Components of EI are broadly classified into Intra-Personal, which includes Self-awareness and Self-management. Catalysts include Energizers. Inter-Personal, which include Social awareness and Relationship management.

Intra-Personal Skill

Self-awareness: As the word describes it's all about identifying and understanding one's own emotion. This being an important measuring component EI one must carefully examine and understand the cause and effect of the day-to-day actions. Introspection is the main agenda here the more one questions oneself the better they understand themselves. This method will help us identify our strengths, weakness as well as help us of how to react and respond to other responses or reactions.

Self-management: Here the prominence is on managing and rendering one's emotions in the right way and at the right time. The main itinerary of self-management in EI is to express or allow others to express without any constraints or prejudices and to portray in a better way to handle any conflict or difficult situations.

Fig.2: Components of Emotional Intelligence

B. Catalysts

Energizer: Emotionally intelligent and motivated people (The energizers) not only be preoccupied in achieving something better but also inspire others to do so. It's about being passion oriented rather than materialistic like for money or position, this not only gets in a lot of respect to the energizer but also impacts the society most positively. This pioneer brings in healthy competency and spirit of commitment.

C. Inter-Personal Skill

Social awareness: Standing in one's shoes before responding is what is expected to collaborate easily with the people. This is not about being sympathetic but to have the empathy to make the right decision concerning all aspects.

Relationship management: This social skill talks about blending and connecting with people as well as building relationships and networks. Socializing is about coming down to the same frequency line and exploring the comfortably of expressing emotions and ideas. This will build a strong connection and trust among the employees as well as between the employee and manager. A person with high emotional Quotient will be great at showing care and respect. This is a great sign of unity in diversity.

III. TECHNIQUES

There are quite a few approaches to recognize the emotions of a person, like speech or voice recognition which focuses on the tone, pitch, and loudness (non-verbal). Based on the data available the input data on processing is categorized into a different emotion.
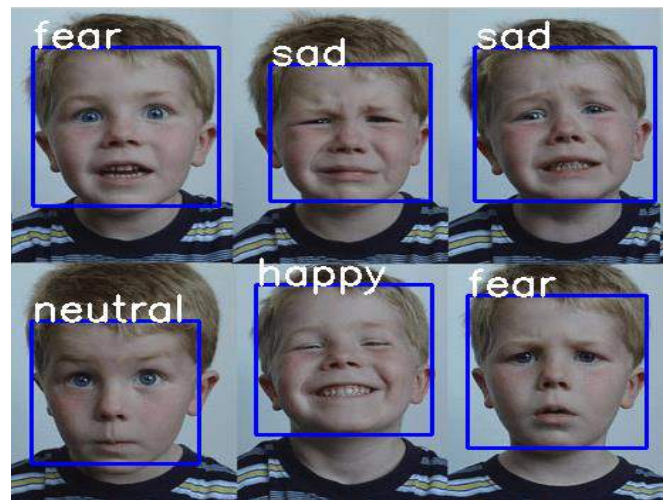
Fig.3: Facial expression detector

Added to the non-verbal categorization the machine must even consider the verbal content and accordingly match the pattern. Coming to the next we have the most effective contributor, the facial expressions. A good machine which predicts the expression through a combination of overall facial muscle movement should also be able to detect facial expression in any light intensity.

Next, we have Physical-Neurological monitoring method with high-quality sensors like electroencephalogram, galvanic skin response, and Electromyogram for identifying a more accurate state of emotion. An electroencephalogram (EEG) helps to record electrical wave patterns in the brain. An Electromyogram (EMG) records the electrical activity of muscle. The galvanic skin response (GSR) has a check on sweat gland which reflects the intensity of emotion.

IV. APPLICATIONS

Emotional Intelligence has great applications in many fields. Firstly, security is one of the important aspects of any domain. Humans being one of the crucial parts of the chain, recognizing one's objective by facial expressions and accordingly sending notifications to the required personnel makes the system more efficient. Secondly, for safe journeys driver must be cautious. To aid him, vehicle alerts can be produced in case if he falls asleep or feels drowsy. Thirdly, on capturing one's responses and analyzing one's expression we can detect one's interest and truthfulness, using this data we can recognize one's willingness in particular product and this can result to better e-commerce promotions; the same data can be used in interviews, like if the candidate is lying or not or if he is a perfect fit for the job or not, etc. likewise we can even comprehend how well students are engaged in classes in case of an E-learning supported classroom. Last but not the least the Virtual reality games with EI can get as crazy as ever. Based on the emotions and behavior being recognized by a webcam, headset, data-suit or a sensor gaming environment can be changed making the player feel more realistic and exciting.

V. CONCLUSION

In the process of building a machine that mimics human completely, we have passed by various domain from machine learning and artificial intelligence to robotics. With the same goal now, the focus is on Emotional Intelligence. More and more exploration in the domain of EI will lead to better decision-making capabilities, strong personal and social relationship, increased team performance and leadership, and finally, reduce destructive behavior which in turn promotes universal peace. On the contrary, EI can get destructive if misused. Though it takes a long time to develop this skill, might reduce manpower in the long run.

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Overview of Use of Raspberry Pi in Implementation of Machine Learning and Image Processing

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ABSTRACT

Raspberry Pi is a low cost credit sized computer that anyone can purchase and use. It is necessary to understand the usage of it and how to implement it with current technologies. This paper will focus on how one can implement Machine Learning techniques and Image processing effectively in a Raspberry Pi.

Keywords : Raspberry Pi, Machine Learning, Image Processing

I. INTRODUCTION

There are three major concepts introduced in more detail in this paper: Raspberry Pi, Machine Learning and Image Processing.

Raspberry Pi, is a readily available low cost, credit sized computer that can be plugged into any monitor or TV and can be accessed using any keyboard and mouse with a USB connector. Raspberry Pi uses its own operating system named Raspbian OS. It is a free operating system that is based on a UNIX like operating system named Debian OS and is optimized for the Raspberry Pi hardware. The important thing to remember is all UNIX commands work in Raspbian OS. There are several models of Raspbian Pi available and Raspberry Pi 3 Model B+ is referenced here.

Machine Learning, is a rapidly growing field in today's world. Machine learning essentially is to detect patterns in data which have some meaning in context to the problem. Nowadays the world is engulfed by machine learning based technology, from search engines which figure out how to give the best possible results to advertisers figuring out how to present the best possible advertisements, filtering of emails and other endless solutions. There are many ways that machine learning can be implemented, and the main focus in this paper is on Object Detection through machine learning.

Image Processing, helps in showing how objects detection can be implemented in a raspberry pi. Hence it will involve the need to manipulate images to a certain extent. Image Processing is an approach to enhance and alter raw images received from cameras or sensors. The method used in this paper is Digital Image Processing.

The rest of the paper is organized as follows: section 2 gives requirement, section 3 throws insight on getting your Raspberry Pi ready, section 4 gives the details about how to train a basic model in desktop, section 5 gives an idea about how to run the application on Raspberry Pi and section 6 gives conclusion.

II. Requirements

There are several requirements that would be needed to implement this solution, listed as follows:

Hardware requirements

Raspberry Pi 3: To run your trained model and program to perform object detection. The advantage of using a raspberry pi is that we would not need an entire computer or laptop to execute programs.

A camera module/webcam: The camera will be attached to the pi through which the pictures will be sent to the object detection program.

A desktop with or without a GPU: There are limitations while using a raspberry pi, one of them being it can't handle training or retraining of models. Hence using a desktop preferably with a GPU is the best to train models. The more powerful your desktop the faster you would be able to train your models.

Software Requirements

TensorFlow: It is a free and open source library developed by Google. It can perform a wide range of tasks and can be used for Machine Learning applications.

OpenCV: OpenCV that stands for open source computer vision is a free library of programming functions. OpenCV will help us perform image processing.

Python: Python is like most languages used today a high level general purpose programming language. Python is suitable as a scripting language because it is directly compiled to byte code and executed. Python is used today because it has allowed us to write clear and logical applications for tasks of any size, this is due to its strong structuring constructs.[4]

IDE: As for which IDE i.e., Integrated Development Environment one should use, there's no specific one. Anaconda and Visual Studio are two of my favourite IDE's and they will do the job.

PyPI: The python package index is repository of software for the Python programming languages. PIP is the tool used to install the packages. PIP is a simple and elegant way of installing the dependencies using a single command line.

III. Getting your Raspberry Pi ready

In order to get your raspberry pi ready to run your machine learning applications, first and foremost work is to connect your raspberry pi to a monitor to be able to access the UI. The Pi supports different video, HDMI being the most common and obvious choice in this case. The bare minimum setup would require you to use a mouse and keyboard, both of them can be connected via the USB ports available on the Pi board. You will also need to connect a SD card to use with the Raspberry pi, you will need to flash your SD card, this is a process that involves flashing an operating system on to your SD card. This can be done from Windows, Linux or OS X , Linux being the easiest option out of the three. You can now connect your raspberry pi to the internet , wired or wirelessly. [1][2] Once it is setup all the above mentioned dependencies need to be installed. Firstly install Python since doing so will make your life way easier as then you can install the remaining dependencies using PIP. A suggestion in general would be to always create a virtual environment to work in, these applications require one to install a lot of dependencies and at times we can end up creating a mess of it and then trying to delete the ones that aren't required is a task. Hence by creating a virtual environment your dependencies will exist only within it and not affect your OS outside of it. Once the virtual environment is created install TensorFlow and OpenCV using pip commands. Based on the program and application, pip and the remaining packages are installed. Once installing all the dependencies is done, the raspberry pi is now ready and will be able to run machine learning applications.

IV. TRAINING A BASIC MODEL IN DESKTOP

Once the raspberry pi is ready to run machine learning applications, it needs a trained model to do so and the training cannot be done on a raspberry pi,

it's merely a tool to run your programs. Retraining a neural network for your project is the simplest way of implementing a machine learning application and since majority of students would be doing that for better accuracy. To give a small understanding of a neural network its basically trying to mimic the brain, in technical terms," A neural network is an interconnected assembly of simple processing

elements, units or nodes, whose functionality is loosely based on the animal neuron. The processing ability of the network is stored in the interunit connection strengths, or weights, obtained by a process of adaptation to, or learning from, a set of training patterns."[3] as defined in the book, "An Introduction to Neural Networks" by Kevin Gurney. My interpretation of a neural network would be trying to recreate a set of artificial neurons that interact with each other and can learn based on different criteria, this put together is a neural network. If you choose to retrain your neural network such as INCEPTION v2 or MOBILENET v2 you need first pick which model you want to retrain since INCEPTION for instance is an extremely heavy model and your desktop might be able to retrain and run the model but once imported to Raspberry Pi it is sure to crash the raspberry pi since a raspberry pi does not have the processing power to run such heavy models. Hence choosing a lighter model like MOBILENET would make more sense if your end goal is to be able to run it on a raspberry pi. Hence to reiterate using retrained CNN is perfectly fine if you can manage to make it light enough to be able to run smoothly on the pi. This is a very important thing to remember since most people manage to create perfectly running machine learning applications on their desktops but when importing the project to a miniature PC like the raspberry pi the program fails to run or takes too long to execute.

V. RUNNING THE APPLICATION ON RASPBERRY PI

Once you have created a light CNN to run on your raspberry Pi, the last step would be to run the program on the raspberry pi as when it is connected to a power source. Let's take an example to understand this better, imagine if you were going to be using a CCTV camera as the camera module which is usually connected at a height then it would be impractical to have to connect a monitor along with a keyboard and mouse and then run the program through the command prompt. What should happen is and when the raspberry pi is connected to a camera and an external power source it should immediately run the program. There are several ways to do it is to make changes to the cronfile. The cron is software which is present in Linux operating system which can be used to automate the any task that is scheduled. Crontab is a given list of commands that can be used to execute scheduled tasks at scheduled times. Open crontab -e from the command prompt while in root and @reboot specify the location of the file to be executed. Now whenever the raspberry pi is connected to a power source it will automatically run the program that was scheduled.

VI. CONCLUSION

Firstly, a basic understanding of an application whether it works fine on your PC or laptop it is not guaranteed to work everywhere and understanding this is important since portability is a key factor for the success of any application. If it cannot be implemented everywhere then it is not a successful product. Hence making sure you have tuned out all the tiny mistakes and made the program as flexible as possible so that it worked everywhere is always a must. In regards to this application in particular remember that a raspberry pi as amazing it is, it's performance capabilities are limited. Maybe in the future there might be more powerful mini computers like the raspberry pi but as it stands now we have to make sure we have optimized our model as much as possible to make it run smoothly and quickly on the raspberry pi.

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Analyzing GraphQL and implementing the framework on Android devices

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ABSTRACT

This paper is a highlights how mobile devices can query data and information efficiently by using GraphQL. This paper reviews the the Graph QL framework and discusses its role in making intelligent requests possible. To improve data efficiency and reduce device overhead, we will be using GraphQL in relaying queries to APIs.

Keywords : GraphQL, Querying Language, Android, Mobile devices.

I. INTRODUCTION

Data Query Languages (DQL's) or Query Languages (QL's) are used to create queries to communicate with information systems and databases. QL's make it easier to handle data from server sources which hosts huge chunks of data. They were primarily made to handle creating, deleting, accessing, and modifying data with databases. There are multiple QL's like Contextual Query Language (CQL), Java Query Language (JQL) etc but the one query language in our day to day services that we are accustomed to is the REST QL's or simply REST APIs. Recently it was convoluted that REST API's still faced a couple of problems with respect to making multiple routes to endpoints and retrieving a bunch of data which is not going to be of full purpose.

Although the REST architecture was phenomenal, it had its own shortcomings which weren't addressed. When it comes to REST, everything component is handled as a resource. Using HTTP allows you to

operations like GET, POST, PUT and DELETE but the problem was the multiple rounds it was making at multiple endpoints to retrieve data. Another common problem that REST possessed was over fetching and under fetching of data. For every request initiated, we would retrieve a huge dataset from which we need to extract the data that we need. This indeed posed a huge load on the network receptors and the devices too. For example, if a blog post consisted of properties like : id, user, title and body, using a REST request we would end up downloading the entire set and there would be no way to limit the response to contain only certain specific fields like title and user.

II. GRAPHQL

In 2015, Facebook decided to come up with a new query language to solve the existing problem that the REST API's faced. It ended up creating a dent in the online space when it came to consuming data. Graph Query Language or GraphQL was born. GraphQL was an excitingly new prospect to help imagine data

in a new way. The major shortcomings that REST posed were eliminated with this new venture. Although it was established in 2015, it gained prominence in no time.

GraphQL is not wired in to any specific storage structure or database and instead is backed by your data and code. A GraphQL service is created by defining fields and types and then providing functions for each.

Once a GraphQL service is set up, (usually on a web service) it can be sent GraphQL queries to verify and execute. The query is first checked to ensure it refers to the defined fields and types and then the functions are executed to produce the required result.

2.1 - SCHEMAS AND TYPES

We will now look into the schemas and types associated with GraphQL and how we can create leverage out of them. As GraphQL can be used by any programming language or framework, we will look into the concepts rather than the implementation-specific details.

GraphQL services can be written in any language. As we can't stick to one specific language to talk about or handle GraphQL like lets say Python, Rails or Javascript, we define our own language called the GraphQL Schema language. It helps us to communicate in a language-agnostic way. The GraphQL schema consists of a basic component called object-types which represents the kind of object that can be retrieved from your service. Let us consider this piece of code :

```
type Character {
  name: String!
  appearsIn: [Episode!]!
}
```

Fig 2.1 - Graph QL Type

Character is a GraphQL object type with some fields. The appearsIn and name are fields on the character type. String! is a non-nullable built-in scalar types which holds in strings and Episodes! is a

non-nullable type which holds in an array of Episode objects.

2.2 - INTERFACES

GraphQL supports interfaces. It is nothing but an abstract type which includes certain fields that a type requires to implement an interface. Let us consider this interface :

```
interface Character {
  id: ID!
  name: String!
  friends: [Character]
  appearsIn: [Episode]!
}
```

Fig 2.2 (a) - An Interface.

Here, the type that implements this interface should needs to have the same fields with the same return types and arguments.

```
type Human implements Character {
  id: ID!
  name: String!
  friends: [Character]
  appearsIn: [Episode]!
  starships: [Starship]
  totalCredits: Int
}

type Droid implements Character {
  id: ID!
  name: String!
  friends: [Character]
  appearsIn: [Episode]!
  primaryFunction: String
}
```

Fig 2.2 (b) - Implementing an Interface

Both of these types have fields from Character interface, but also contain extra fields that are pertinent only to that specific Character type. When we want to return a specific set of objects, interfaces are useful.

III. ADVANTAGES OF GRAPHQL

One of the biggest advantages of GraphQL is that it is client-driven which means that you get what you want. We get to define the type of response and

therefore the client on server has more control power. We can end up doing multiple calls which places a huge burden on both the device and server. Instead of bouncing off multiple endpoints, we can hit one endpoint and get what we want.

IV. SETTING GRAPHQL ON ANDROID

To get started on Android, we need to have a bunch of libraries and dependencies. At first, we are going to configure apollo-graphql which is a caching library for graphql written in Java with the following lines of code being added to the project.gradle file.

```
//In your project build.gradle
dependencies {
    classpath 'com.android.tools.build:gradle:3.0.1'
    classpath "org.jetbrains.kotlin:kotlin-gradle-plugin:1.2.21"
    classpath 'com.apollographql.apollo:gradle-plugin:0.3.2' //Add
this

    // NOTE: Do not place your application dependencies here; they
belong
    // in the individual module build.gradle files
}
```

Fig 4.0.1 - Dependencies

There are a bunch of other dependencies to be added like

● implementation "com.apollographql.apollo:apollo-runtime:0.3.2'
● implementation "com.apollographql.apollo:apollo-android-support:0.3.2"

Additional plugins need to be added to build.gradle file like

● apply plugin: 'com.android.application'
● apply plugin: 'kotlin-android'
● apply plugin: 'kotlin-android-extensions'
● apply plugin: 'com.apollographql.android'

Now we need to be able to generate code-gen files which will allow us to take the schemas of the GraphQL queries and convert them into Java classes. Apollo-codegen is an amazing library to get this job done. For this, we need to install apollo-codegen via npm and then create a directory called "graphql" under the /src/main directory. This will host the schema file with a .json extension which will contain the responses of the introspection queries.

Now since we have all the dependencies set up, it is time to wire in. To demonstrate an example in this paper, we will be considering GraphQL Api of Github. We are going to use OkHTTP as our networking client and add headers and receptors to it if needed. This client also supports a level 3 caching so we have this ar our disposal too. Now we need to create an apollo-client object and attach our OkHTTP networking object which is going to initiate requests. Make sure you specify your base url of the api too. A FeedQuery object will be able to set parameters like limit and type to our GraphQL queries. The getters and setters are automatically generated by apollo. The .graphQL file will contain our queries so let us make sure we have them well defined.

```
query FindQuery($owner:String!,$name:String!){
  repository(owner:$owner, name:$name) {
    name
    description
    forkCount
    url
  }
}
```

Fig 4.0.2 - GraphQL queries in the .graphQL file

Now we must create an Apollo call, which takes in the data of the FeedQuery object as its type. Also we need to set the query of this to the feed-query object that we initially created. GraphQL supports both RxJava and callback methods. As far as the callback method is concerned we will call the enqueue method on the callback ApolloCall object and the enqueue method executes asynchronously which does not affect the main thread. We then obtain a nonnull response object from which we can obtain the raw data.

V. VALIDATION

The type system tells us if a query is valid or not. This helps the developers by keeping them informed about the validity of the query and if runtime checks can be performed on it or not. A test file can also be run on the queries to check the correctness of them.

```
{
  hero {
    ...NameAndAppearances
    friends {
      ...NameAndAppearances
      friends {
        ...NameAndAppearances
      }
    }
  }
}

fragment NameAndAppearances on Character {
  name
  appearsIn
}
```

```
{
  "data": {
    "hero": {
      "name": "R2-D2",
      "appearsIn": [
        "NEWHOPE",
        "EMPIRE",
        "JEDI"
      ],
      "friends": [
        {
          "name": "Luke Skywalker",
          "appearsIn": [
            "NEWHOPE",
            "EMPIRE",
            "JEDI"
          ],
          "friends": [
```

Fig 5.0.1 - A valid query

VI. EXECUTION

After validating, the query is executed by a GraphQL server which returns a result which resembles the requested query in a JSON structure. The GraphQL query cannot execute without a type system. Each query of a GraphQL function can be described as a function or a method. Each field is backed by a resolver. If a field returns a number or a string, then it is complete.If the field returns an object, then the query contains a selection of fields that pertain to that object.

The graphQL server represents all possible entry points to GraphQL API queries as root type.

```
Query: {
  human(obj, args, context, info) {
    return context.db.loadHumanByID(args.id).then(
      userData => new Human(userData)
    )
  }
}
```

Fig 6.0 - Rootfields

The above query provides human is a query type that accepts id as the argument. To access a database, context is used to grant access. The query returns a promise since it is asynchronous. GraphQL waits for tasks, futures and promises to complete which ensures optimal concurrency.

VII. CONCLUSION

In this paper, we have clearly analyzed how to implement GraphQL in mobile systems and migrate to a better way of retrieving data from APIs. We have also discussed the use of GraphQL and how advantageous it is when it comes to bouncing off one endpoint to retrieve necessary data. Being able to quickly configure endpoints for your server with the language of your choice makes it much more flexible to use this querying language. There is no language or best practices as such for different platforms while using graphQL but this is more of a methodology which focuses on the implementation aspects of the technology.

FUTURE WORKS

There are a few setbacks to GraphQL but it has really come a long way in providing an alternative protocol to query data. GraphQL as such has quite a few problems and this can be addressed in improving the efficiency of this querying language. Complex querying is an issue in graphQL because once the user requests too many nested objects at once, the components struggle to handle this situation, so for smaller applications, REST still works best. Rate limiting is also something that needs to be considered since everything between expensive to cheap operations can be performed and that at

someway undermines capacity of the data being requested.

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Significance of Natural Language Processing in Language Based Automated Systems and Intelligent Agents

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ABSTRACT

Ability of computer program to understand human language as it is spoken is Natural Language Processing. This paper describes briefly about Processing, Generation and Understanding of Natural Language, the general working phases and also applications of NLP in the areas of Machine Translation, Natural Speech Understanding, Automatic Summarization, Text Analytics / Mining, Question Answering Systems and Chatbots. This paper also emphasizes on various aspects of automated systems and the significance of natural language processing for such applications. Also, the role of Natural Language Processing for intelligent agents with various features of those agents are presented.

Keywords : NLU, NLP, NLG, Automated Systems, Intelligent Agents

I. INTRODUCTION

Natural Language Processing is a field of computer science and linguistics concerned with interactions between computers and human language [5]. It is the machine handling of written and spoken human communication. It consists of different methods derived on linguistics and statistics coupled with machine learning to model the language of automation.

NLP is broken down to steps like morphological and syntactic analysis, semantic analysis, discourse integration and pragmatic analysis. It employs a variety of methodologies to solve the ambiguities in human language like automatic summarization, feature extraction as well as emotional detection.

NLP is widely classified in to Natural Language Understanding and Natural Language Generation [Fig 1]
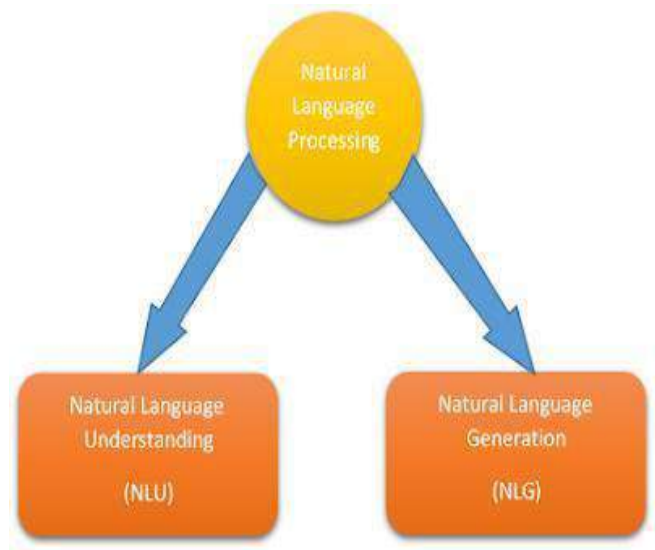
Fig 1: Classification of Natural Language Processing

Natural Language Understanding systems convert samples of human language into more formal representations such as parse trees or first order logic structures. NLU is basically a part of post processing of text after the use of NLP algorithms. It is involved in understanding grammar of text-Syntax, understanding the meaning of text-semantics and also what exactly the text is trying to achieve.

It is applied in real time for relatively simple to complex tasks like data collection and analysis ,short instructions for intelligent robots, automatic analysis of e-mails, human interacting bots and other applications that require conversion of speech to text and one language to another language.

Natural Language Generation systems convert samples of human language in to more formal representations such as parse trees or first order logic structures. NLG systems are also used as interactive explanation tools which convey information in an understandable way for the new users in engineering and medical fields. NLG systems performs Content Determination and Text Planning i.e., how information is structured and communicated to user simultaneously, Sentence Planning i.e., how information will be split into separate paragraphs and sentences with correct grammar, Realization i.e., to generate the sentences with proper grammar
In real-time NLG systems are used to generate textual weather forecasts from graphical weather maps, to summarize statistical data retrieved from database or spreadsheet, to explain medical information in a patient friendly way etc.

II. DIFFERENT PHASES IN NLP

Following are the different phases of Natural Language Processing[Fig 2]

A. Morphological Analysis and Syntactic Analysis
In linguistics, individual words from sentences are analyzed into their nonword tokens and components known as Morphological Analysis which is commonly known as study of structure and formation of words Syntactical Analysis/Parsing is a

process of analyzing text made of sequence of tokens to determine its grammatical structure with respect to a given formal grammar. Syntactic analysis builds structural description of the sentence involves determining the subject and predicate and the place of nouns, verbs, pronouns, etc. The System is enabled to read through the input sentence word by word and produce a structural description at the end. Syntactic analysis includes consideration of morphological and syntactic knowledge on the part of the natural language processor.
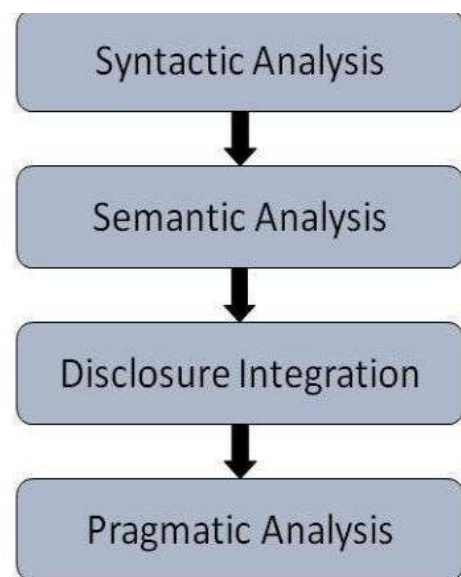
Fig 2: Different Phases of Natural Language Processing

B. Semantic Analysis
Semantic Analysis is carried out based on the knowledge about the structure and meaning of sentences, words and phrases. It is a form of representing context independent meaning of the sentence. It involves some of the stages like dependency parsing which identifies how the words of a sentence relate to each other, finding the noun phrases, named entity recognition which identifies the named entities that are the main designators of a sentence like the person names, organization names, locations etc. as a part of semantic analysis.

C. Pragmatic Analysis
Pragmatic Analysis considers the context in which a particular word or text is used. It considers the

intentions behind using the text. It deals with the usage of sentences or words in different situations. In this phase the differentiation of "what was said" and "what is actually meant" will be made. The main challenge of natural language understanding is the ambiguity. Pragmatic analysis helps to reduce the ambiguity by understanding the context and meaning of usage.

D. Discourse Integration

Discourse Integration is usually carried out by considering the preceding sentences of words and succeeding sentences of words. It may also consider the meaning conveyed by the whole paragraph. Usually the sentences of a paragraph go in a flow and this phase tries to utilize this feature to understand natural language meaning.

III. ROLE OF NLP IN AUTOMATED SYSTEMS AND INTELLIGENT AGENTS

A. Significance of NLP for Automated Systems

Automated systems are developed to make human life simpler and easier by making a set of tasks programmed. NLP plays a significant role in building automated systems in major fields such as production and engineering, home automation systems, evaluation systems, robotic processes automation etc.

Major benefits of automated systems are:
- Better utilization of time, money and resources.
- Reduce human errors and biases.
- Ease of management.

Main challenges while using automated systems are:
- Security.
- Complexity.
- Accuracy.

Language based automated systems are developed for question answering, summarization, handwritten character recognition, evaluations, speech interactions and for many other applications. They should be able to understand the language of communication and to generate the natural language. Language based automated systems are implemented in the following four NLP and NLG phases.

Analysis: The system must be capable of understanding the syntax, morphology and semantics of a particular text under consideration.

Recognition: Based on the analysis performed it must be capable of identifying the context in which the particular text appears. Also, it should be capable of predicting the part of speech features, word features and other lexicalized features of the given text.

Classification: For the purpose of understanding the natural language text, they must be classified based on the recognized contextual, part of speech, word and other lexicalized features.

Interpretation: The classified text is interpreted by the system using efficient algorithms and other learning techniques depending on the application which is used. In this phase many resources like the word nets, dictionaries, language specific word lists etc. are used. Interpretation phase is the most important phase as it determines the accuracy of the predicted output.

Output Generation: Based on the application under consideration, the output is generated which can be in the form of natural language or digitized form.

B. Significance of NLP for Intelligent Agents

Intelligent agents are entities that perform activities autonomously to achieve specific goals. Intelligent agents map its perceptional input at a particular instant to an action. Logical agents decide on its action based on logical deduction. Reactive agents map the current situation to an action directly. Belief desire intention agents uses beliefs which is acquired from past actions, desires which depends on the output expected and intentions which are the desires which the agent is more committed as parameters to decide on the actions.

Intelligent agents can be classified into the following classes:

Simple Reflex Agents: uses only current perceptions and does not depend on history of perceptions.

Model Based Reflex Agents: uses current perceptions and also history of perceptions to decide on the actions.

Goal Based Reflex Agents: uses the goal information also together with current perceptions and history of perceptions to select a desired action among multiple possibilities.

Utility Based Reflex Agent: uses an utility function to maximize the utility of the action chosen.

Learning Agents: works initially in an unknown environment but improves its actions through learning.

Intelligent agents must be capable of understanding and generating natural language. With the advent of keyboard less devices, autonomous vehicles etc. the importance of natural language processing for intelligent agents has increased significantly. The autonomous agents are enabled with listening, speaking, explaining, adapting and understanding the context of the language.

The below features emphasizes the importance of natural language understanding and natural language generation for intelligent agents.

Conversational: Intelligent agents must be able to understand what is the task assigned to it or it is instructed to do. It cannot clear its ambiguity by itself as it does not have a pre-defined script.

Explanatory: Agents must be capable of explaining the reason for selecting a particular action in a given situation.

Sociable: Agents must be having an awareness of the environment in which it is present and should be capable of interacting with human counterpart.

Context Aware: Contextual intelligence is a must as the agent must be capable of pro-actively selecting a service based on the behavior by its human counterpart in a similar context.

Engaging: Agents must be capable of understanding the importance of a request from the natural language spoken. Based on the priority or urgency of a particular request the agent must behave in a desired way.

IV. APPLICATIONS OF NLP

Below are the broader areas where NLP is widely used [Fig 3]. The key component in all the applications is text and speech processing[4]

Fig 3: Various applications of NLP

1. Text Mining/ Text Analytics

Text Mining key technology in NLP. It is carried out by examining large collections of written resources to generate new information, and to transform the unstructured text into structured data for use in further analysis using NLU methods[3]

2. Machine Translation

Machine translation helps to overcome natural language barriers by converting information from one language to another. Different levels of NLP Machine translation approaches are implemented such as direct translation, rule based translation, corpus based translation and knowledge based translation to undergo high level analysis and translation [6].

3. Speech Understanding

Speech is provided as input to the Speech Recognition system which results in retrieving all the information specific to particular task. Also, another form is programmed production of speech by generating the utterances by processing the text [9].

4. Automated questions and Answering/ Chatbots

NLP has also evolved in Questions and Answering sections, Chatbots and voice activated technologies

which have renewed interest in natural NLU and NLP.

Researchers forged ahead with reinforcement learning to teach to agents to design their own language by dropping them into set of simple words and giving them goals that can best achieved by communicating with other agents [4].

5. Automatic Summarization

Internet is an aggregate of enormous information and its challenging to the web user to verve through the information on web. So, NLU- Statistical Machine Learning methods filters out summaries of significant facts from the large text document [7]. Different Automatic Summarization of NLP like Abstract vs. Exact Summary Single vs. Multidocument Summary are existing to reduce bigger text in to smaller abbreviated representation [8].

V. CONCLUSION

Natural Language Processing is widely blended with the extensive number of educational connections pertaining to science and research fields, linguistics, web-learning, automatic evaluations systems, training artificial intelligent agents etc. This paper is an attempt to look through the significance of natural language processing for all these applications emphasizing on automated systems and intelligent agents.

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An Overview on Cashier-free Checkout System

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ABSTRACT

Advancement in the technology has lead to major improvements in the field of Image processing. Computers can capture high resolution images and videos; manipulate it like adding special effects and many more. Object Recognition in Images is a type of Image processing where the computation part is to recognize the object present in the image. This Image processing has many applications in the field of robotics, automation, security. As the computers are able to extract the information from the image that is captures and this gives computer another dimension of intelligence. With this intelligence the computer can be programmed to perform certain tasks based on the content of the image.

Keywords : Real time Image Processing, Computer Vision, Deep learning

I. INTRODUCTION

Image processing has been the trend in the current computational world. Image processing is the usage of computer algorithms to perform the processing on the images. Processing is usually done for specific data extraction from the images, for example reading the text in the images, identifying the pattern in the images, or recognizing the objects present in the images etc. Image processing is a type of signal processing which usually has an image as input and output may be image or features/characteristics associated with that image. Image processing includes three steps:

· Image acquisition via any of the acquisition tool

· Analyzing and manipulating the image

· Output, where the result is generally an altered image or the report that is based on the analysis made on the input image.

This paper is on one of the application of Image processing which could make shopping in hypermarkets a lot easier.

II. EXISTING SYSTEM

As there was a sudden hike in the number of supermarkets that were established an easy way of billing was required. Hence the barcode scanning system for the billing process was adapted. A barcode is an optical representation of data which is machine-readable. The data usually represents or describes something about the product/object that carries the barcode. Traditional barcodes represent data systematically by varying the spacing's and widths of parallel lines and may be referred to as one-dimensional (1D) or linear. These barcodes are scanned by a device known as Barcode scanner/ Barcode reader. And later two-dimensional (2D) variants were developed, using dots, rectangles, hexagons and other geometric patterns, called 2D barcodes or matrix codes, although they don't make use of bars as such. Initially, these barcodes were only scanned and decoded by the special optical scanners and barcode scanners/readers. But as the time passed by application software

became available for the devices that could read the images, such as smartphones with cameras.

Barcode reader is an electronic device that reads and output printed barcodes to a computer. Barcode readers/scanners consist of a light source, a lens and a light sensor that translates optical impulses into electrical impulses. In addition, the scanners also contain a decoder circuit that analyses the bar code's data that has been provided by the sensor and sends the barcode's content to the barcode scanner's output port.

There are different technologies implemented in the barcode scanners. Few of them are as follows:

- Pen-type Scanners
- Laser Scanners
- CCD Scanners (LED Scanners)
- Large field-of-view Readers
- Omnidirectional Barcode Scanners

Barcode scanners read the black and white lines which are on the products and feed the information to a computer. The computer then identifies the product using a product database. The barcode scanning process happens like the following steps:

The Scanning device head shines a LED or laser light onto barcode.

The emitted light hits the barcode and gets reflected back into a light detecting electronic component called Photoelectric cell. White areas part of the barcode reflects most light whereas black areas reflect the least.

As the reads the barcode, the photoelectric cell generates a pattern of on-off pulses that corresponds to the black and white lines on the barcode.

. There's an electronic circuit attached to the scanner that converts these on and off pulses into binary digits (0's and 1's).

The obtained binary code is then sent to the computer which is attached to the scanner. That computer detects the details of the product like

maker, cost, and quantity of all the products sold, by the code.

Fig. 1 Barcode scanner working
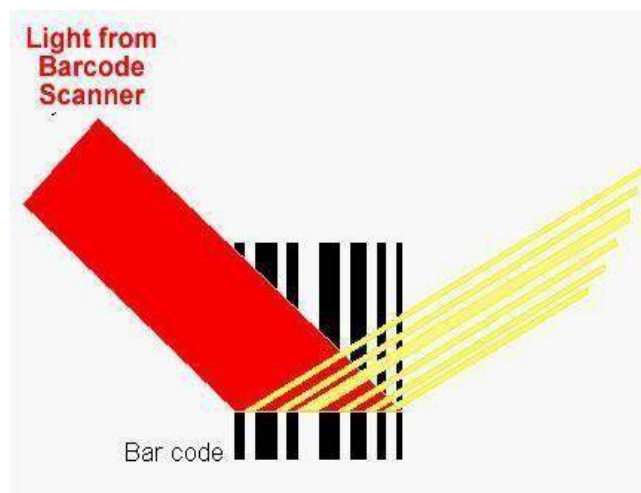
Advantages of Existing System

- Barcode scanning system eliminate the possibility of human error. Error occurrence is significantly higher than barcodes when it is manually entered data.
- Barcodes are less expensive to design and print.
- They can be customized economically, in a different variety of materials and finishes.
- Barcode system is extremely versatile. They are used for necessary data collection. The data can include pricing or information regarding inventory.
- Barcode scanning system is very easy to get adapt to. It reduces the employee training time.

Disadvantages of Existing System

- Pricing Discrepancies: When discounts are applied to barcoded products, the store employees may forget the update the discount price. This can lead to confusion during the checkout near the counter and cause in delays, inconveniencing the customer and the other customers waiting in the queue.

- Scanning Problems: If a barcode doesn't get scanned due to some technical reasons, the cashier has to manually enter the corresponding numeric code. Because the cashier had become used to scanning barcodes quickly without much effort from their side, their lack of practice in entering the code manually can eventually cause them to be slow or inaccurate in entering the product information, further delaying the checkout process.

- Label Damage: Barcodes that are printed on the torn section of the product packaging or that have been smudged or damaged will lead to scanning problems. If this happens the checkout process can be significantly delayed.

III. PROPOSED SYSTEM

Proposed system is very convenient to the customer. It can be described in the following flow of events:

1. The Customer enters the hypermarket.
2. The Customer picks up the items as per his needs and puts them in his/her bag without needing to scan each item.
3. Those items are added to the customer's virtual cart.
4. The Customer exits without going through any checkout counters or waiting in any queue.
5. Bill amount is automatically deducted from the customer's wallet providing a receipt.

Every customer is identified by the System with his/her unique QR code. When the customer enters the hypermarket, he scans the unique QR code linked to his wallet/account. As the code is authenticated, the customer is then followed by overhead cameras that are installed in the roof of the hypermarket, as they move around the store, without using face recognition [1]. Then the items that are picked by the customer is automatically added to his cart. This is achieved by applying the Machine Learning application of Realtime Image Processing which recognizes the product he's picked up. The accuracy of the product is known by making use of smart shelf sensors. Technology that could be

used is computer vision, sensor fusion and deep learning [2]. These technologies help in detecting the

products when they are taken from the shelves or returned to the shelves. The combination of artificial intelligence, computer vision and data acquired from multiple sensors is used to ensure that the customers are charged for the items they pick up [3].

Fig. 2 View from the overhead camera

Advantages of Proposed System

The advantages of this system are listed below:

- The wastage of time that usually occurs because of waiting in a queue for a checkout is eliminated
- Quick and convenient
- Promoting the Cashless Transaction
- Errors due to barcode scanning are eliminated

Disadvantages of Proposed System

The disadvantages of this system are:

- Huge Capital Investment
- The Intelligence system has to be trained for every product available
- Unemployment

IV. CONCLUSION

Like every system, the proposed system also involves advantages and disadvantages. Since its still in its early stages, we can expect a major development in its domain which overcomes its cons in the future by delivering an error free and convenient experience to the customer and making their routines of their life easier.

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Safe-Ride : Automatic Recognition of Potholes and Humps on Roads using Ultrasonic Sensor and Notifying the Same to the Drivers

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ABSTRACT

There have been humps and pit holes on a path from the day the road came into being. It was one of the main problems of road maintenance. Because of this many accidents and vehicle damages have occurred particularly in a metropolitan city where there are more vehicles. The solution to this problem is to develop a system which uses a beneficiary of regional structure to detect the topographical location of the potholes and protuberances.

Keywords : Potholes, Humps, Raspberry PI, Ultrasonic sensor, Database, Cloud, Android.

I. INTRODUCTION

India is considered one of the rapidly developing countries as of today. India's road network is gigantic and is the dominant means of transportation in India today, giving it a thought about the condition of the roads. Roads indirectly contribute to the economic growth of the country and the roads must be well built and strong. India has troubling street and traffic conditions as the bulk of India's streets are tight and clogged Nowadays street mishaps are a major issue in many provinces, with poor surface quality and uncomfortable street maintenance needs not being met. Road accident is due to the unevenness of the road surface and fast driving. Traffic jam, safety issues, rash driving, lawlessness and increasing load of vehicular traffic are decreasing the quality of the road.

Streets typically have bumps with the intention that the pace of the car can be managed to stay away from mishaps and potholes caused because of nil support of the street and downpour. To eradicate the potholes on the road, several types of research and studies have been done. These irregular road conditions may cause accidents, Reducing the quality of driving and consuming more fuel than required. Hence, in this paper, we have proposed a framework that catches the geological area directions of the potholes and mounds utilizing a worldwide situating framework beneficiary. Ultrasonic sensors are utilized to distinguish the pit openings and mounds and furthermore to gauge their profundity and tallness, separately. The detected information incorporates pothole profundity, the tallness of protuberance, and geographic area, which is put away in the database (cloud) for a specific street. so that the next Driver on the same road would have a pre-data about the road where humps and pit holes are recorded and can be used to give Voice notification to the driver within a given range say 100m away from it by keeping track of his GPS location. The main objective of making a pothole and hump detection system is to help drivers in many ways and thus assisting them in avoiding a future accident by helping drivers to drive safely.

II. RELATED WORK

This segment gives a total portrayal of the current arrangements and concentrates for recognizing potholes and mounds on streets. Yuquan [1] built up a model which utilizes optical imaging rule of 3-dimensional projection change to get generally data of pothole's virtual diagrammatic segment in pothole identification. The technique utilizes straight drove light and 2 CCD (Charge Coupled Gadget) cameras to get asphalt pictures. Numerous computerized picture preparing innovations, including binarization, picture handling, diminishing, three-dimensional recreation, blunder investigation, and pay are led in the arrangement of picture examinations, preparing to get the profundity of potholes yet results get influenced by the force of drove light and ecological components.

Lin and Liu [1] proposed a strategy for pothole location dependent on SVM (Bolster Vector Machine). Example measure dependent on the Histogram is removed as the properties of the picture locale, and the non-straight help vector machine is developed to distinguish whether an objective area is a pothole.

Moazzam [1] has built up a model in which a minimal effort Kinect sensor is utilized it gives the immediate profundity estimations, along these lines making less processing expenses. Cross sections are made for better representation of potholes. The region of the pothole is examined contrasted with profundity. The rough volume of pothole and protuberance is fathomed utilizing the trapezoidal guideline on territory profundity bends by means of asphalt picture investigation. Other than pothole's zone, length, and width are assessed. The paper likewise proposes an approach to describe pothole.

Samyak Kathane [1] have proposed a model which is Real-time pothole detection and vehicle accident detection and reporting system and Antitheft. In this system the wireless access point collects the information about potholes, it distributes this information to BMC using wireless broadcast. This system is used for accident detection too. Antitheft

in the car can help to save millions of dollars. Sensor boards that we used for collecting the

environmental data also have an accelerometer that can measure both the vertical and the horizontal acceleration. for example, when a bus goes over the pothole there would be a significant change in the vertical component of the acceleration and for humps, there would be a horizontal component.

Gunjan Chugh [1] have developed a system in which the various road conditions are detected using a smartphone sensor. This system includes a set of sensors installed in vehicles. Using sensors for detecting road condition is one of the most common approaches and making GPS receiver to collect the data. This solution helps to detect the irregularities in roads such as potholes and humps.

III. PROBLEM STATEMENT

Poorly maintained roads are a part of our daily life in most developing countries including India. A well-maintained road network is a must for the development of any country. One of the increasing problem roads face is worsened road conditions such as potholes and humps. Unexpected hurdles or anomalies on the roads may cause a large number of accidents, also due to bad road conditions fuel consumption increases, resulting in wastage of limited fuel resource. All these reasons push us to face the fact that it is necessary to get information about such bad road conditions, collect and distribute it to all drivers on the road, which can warn the driver [4]. So, it is necessary to create an effective road surface monitoring system. Automated pothole and humps detection are the main goal in the system. The aim is to develop a system based on IoT to detect potholes and humps on the road which catches the geological area directions of the potholes and protuberances utilizing a worldwide situating framework recipient. give Voice notification to the driver within a given range say 100m away from it by keeping track of his GPS location via an Android application and update the information as required.

IV. OBJECTIVES

The significance of our paper is to provide the best utilisation of our system to protect the users from accidents by sending the information such as location of potholes and humps to users driving in a rod which data has been pre-recorded in the database from the initial user who travelled on that road. The two major objectives are:

- To capture the data from the proposed system, able to process the data and send it to the next person travelling on the same road using the navigation application for the humps and pit holes.
- Updating the data on the cloud or central server DB whenever a new pit holes or humps are formed from the first person's vehicle sensor travelling on the road using the navigation application.

V. PROPOSED METHODLOGY

This proposed system of detection and notification of potholes and humps to the drivers is a cost effective solution.

Raspberry Pi 4: Raspberry Pi 4 Model's speed and performance is a step up from earlier models. a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, up to 4GB of RAM, The higher bus speed that enables USB 3 support also allows the on-board Ethernet port to support true Gigabit connections (125 MBps) where the last-gen models had a theoretical maximum of just 41 MBps. The microSD card slot is also twice as fast, offering a theoretical maximum of 50 MBps versus 25 MBps on the 3B+. The dual-band wireless LAN, more and faster RAM, and Bluetooth have modular compliance certification, allowing the board to be designed into end products with significantly reduced compliance testing, improving both cost and time to market.

Ultrasonic Sensors: The HC-SR04 is a generally utilized ultrasonic sensor and contains a transmitter and a recipient. It is essentially used to gauge the separations between the item place before it and the sensor. The ultrasonic sensor transmits high-recurrence sound waves and trusts that the reflected wave will hit the beneficiary. The separation is to compute the time interim between the sending of the sign and the getting of reverberation. The working rule of this gadget is shown in figure 2. It chips away at the Doppler Impact. There are numerous sorts of ultrasonic sensors with fluctuating transmission ranges and points of location. This sensor gives about 2cm to 400cm of non-contact estimation include with an exact range that will reach up to 3mm with a 15° edge of location. It is utilized to quantify the separation at which mounds are available before it. Each HC-SR04 module incorporates an ultrasonic beneficiary, control circuit, and transmitter. The ultrasonic sensor is utilized for estimating the profundity of a pothole and stature of a mound and sending the timestamp of the information for figuring the scope and longitude [5].

GPS Receiver: Worldwide Situating Framework is a satellite route framework made up of at any rate 24 satellites and is utilized to catch geographic area and time, independent of the climate conditions. It is kept up by the US Government and is openly accessible to anybody it works in any climate conditions, anyplace on the planet, 24 hours every day, with no membership expenses or arrangement charges. It gets the GPS data from satellites in the National Marine Gadgets Affiliation (NMEA) position. The NMEA has characterized a standard organization for the GPS data. This is trailed by every one of the satellites. The standard characterizes different codes, for example, GLLLatitude/Longitude information, GSV – Point by point satellite information and RMC-Least Prescribed Information. A GPS tracking component is a device that uses the Global Positioning System for determining the location of a vehicle, person, or another asset to which it is attached or fixed. This position will be recorded at regular intervals. The obtained location data can be stored within the GPS unit, or it may be transmitted to a database(local system or central cloud), or internet-connected computer, using a

cellular may be SMS or GPRS, satellite or radio modem embedded in the unit.

Buzzer: A buzzer or beeper is an audio signalling device, buzzer used in this project is an alarming device, Buzzer is an integrated structure of electronic transducers, DC power supply, Active buzzer 5v rated power can be directly connected to a continues to sound.

VI. ARCHITECTURE

The system architecture of the pothole detection system is as shown in Fig 1. The system consists of a sensor, GPS receiver and a computer which processes the received data. The processed data is then used for a database creation of the latitudes and longitudes of potholes and humps. Then that data is shared to a cloud server where it is shared to all users in that road through a [2] Mobile application which gives voice notification to the users while they are few meters away from the potholes and humps guiding them to drive safely avoiding accidents.
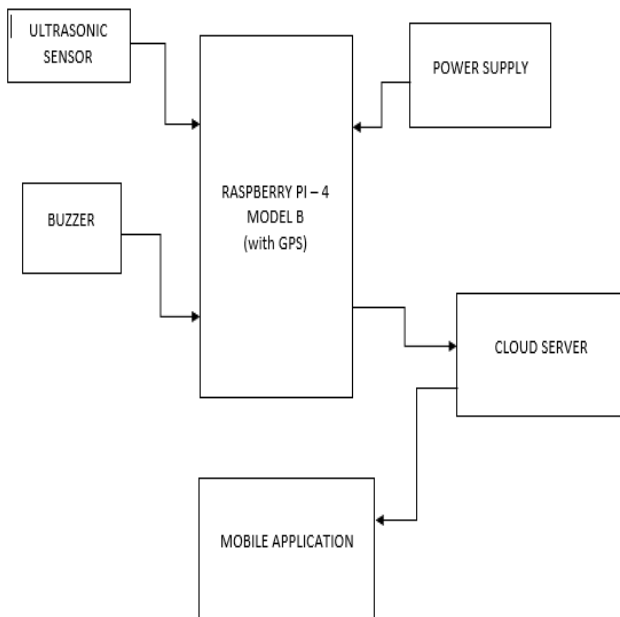
Fig. 1 Components Structure.

VII. DESIGN AND IMPLEMENTATION

The engineering of the proposed framework comprises 3 sections: Raspberry unit, cloud unit and client application unit as shown in Fig 2. is utilized to assemble data about potholes and bumps and their topographical areas and this data is sent to the server. The server module gets data from the microcontroller module, procedures, and stores in the database. The versatile application module gets the data put away in the cloud server database and gives auspicious alarms to the driver. The usage segment comprises of the flowchart for the working of the model is demonstrated as follows:
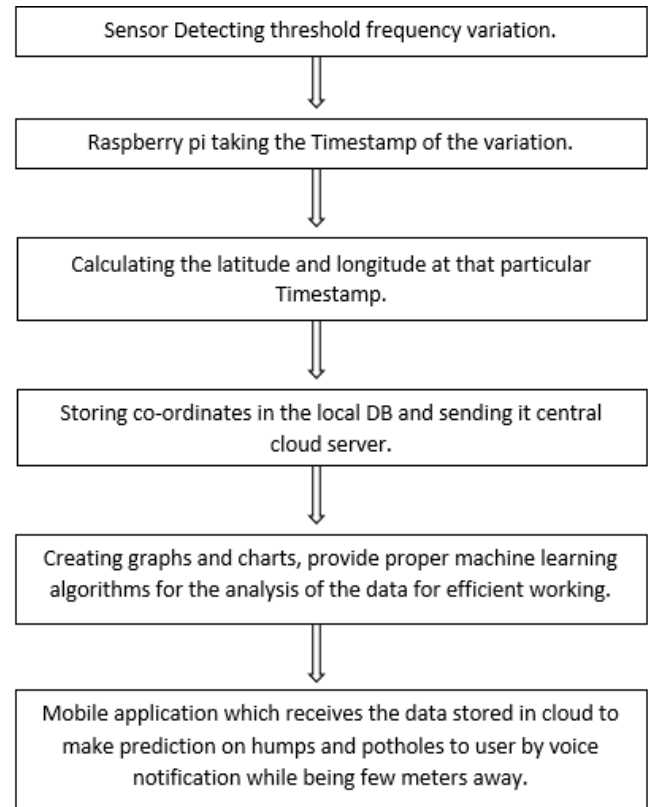
Fig. 2 Workflow of Model.

Raspberry pi module: Understanding the working of the sensor and its information with the proposed framework. sensors ought to have the option to Quantify the Limit separation for the vehicle and the street to identify the mounds and potholes. Getting a similar pattern of data for different sizes of humps and pit holes. Alternatively Making a proper detection with buzzer sound when the threshold is changed. Plotting of the graph from the data obtained for analysis and finding the exact timestamp when the humps or pit holes are detected. Threshold distance monitoring of the ultra-sonic senor for the hump and pit hole detection. Capturing the time stamp when there's a change in threshold distance. [3] Using the data from the GPS tracking and

matching its timestamp to the timestamp obtained from the sensor data and pointing the exact geographic location i.e. latitudes and longitudes. Tracking the GPS of the driver along all the time using any of GPS tracking devices. Matching the timestamp of the data with the time of his location at that time and acquiring the co-ordinates of the location on that time stamp.

Mobile Application module: Developing an Android mobile application or a Micro-service around the proposed cloud platform for mobile devices of the users. The mobile application can help users to monitor their location with also providing them the data stored in the cloud by tracking their location and its distance from an ahead hump or pit holes. Notifying the users through a voice message while they are some distance away from it. This proposed system of detection and notification of potholes and humps to the drivers is a cost-effective solution.

Cloud server module: Creating a Local database for storing the Timestamp values and co-ordinates where the data change has been detected. Sending the data to a Central server Database and sharing it to other devices connected through a common network. Sending an Acknowledgement to the back to device after receiving all data for the removing of data from local storage. Creating a Cloud account with proper infrastructure for the working of the device and storing its data with a standard citation. Moving all the data from the local storage to cloud and assuring of the exact precision of the data obtained to the generated. Sending the processed location coordinates to the cloud server where the data is shared to another driver through an Android application traveling in the same path next. Creating graphs and charts for the analysis of the data gathered and provide proper machine learning algorithms to process and the system efficient in working.

VIII. RESULTS

After Completion of the project we would be getting the following results as the output stored in the

database for a user to access it via an application. Table 1 shows the data stored in the database in standard format.

SL NO	TYPE	TIME STAMP	LATITUDE	LONGITUDE
1	P	2019-08-14 03:15:30.15	12.9563	77.5544
2	H	2019-08-14 03:20:19.31	12.9406	77.5661
3	H	2019-08-14 03:24:12.21	12.9421	77.5668
4	P	2019-08-14 03:27:20.00	12.9434	77.5669
5	P	2019-08-14 03:35:33.07	12.9411	77.5654

IX. CONCLUSION

The model proposed in this paper fills 2 significant needs; programmed location of potholes and mounds and alarming vehicle drivers to avoid potential mishaps and vehicle harms. The system is developed that will be placed at the base of any two-wheeler/three-wheeler/four-wheeler vehicle. The system will consist of two sensors i.e. ultrasonic sensor and GPS receiver. The ultrasonic sensor will detect the pothole/hump and the timestamp of the detection is stored in the database along with the coordinates at that time in the form of latitude and longitude at the local and cloud database The proposed methodology is a monetary practical answer for recognize loathsome potholes and uneven protuberances, as it utilizes ease ultrasonic sensors. An android versatile application is utilized to alarm or inform drivers with the goal that fundamental measures can be taken to maintain a strategic distance from mishaps. Cautions are given as the voice message and furthermore make new identifications to refresh the cloud database helping different clients. The arrangement additionally works in the stormy season when potholes are loaded up with water as notices are given utilizing the data put away in the database. This fills in as a significant wellspring of data to the administration specialists assisting them in the support of street and vehicle drivers with driving securely.

FUTURE WORK

The Proposed project in a large scale can help solve many Real-World problems such as accidents due to new speed breaker on the old road, Reducing the vehicle damages during rainy season by avoiding the pit holes on the weak road. it would also help in notifying the Ministry in charge of the maintenance of roads to fix pit holes and help citizen travel secure, comfort and hassle free. The system is more useful in rainy season as the potholes and humps get covered with water. In future, a camera can be included in device to click a picture of detected pothole or hump. Also, a tracker can be included in device so as to improve security measurements.

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Credit Card Reader with Face Recognition Using Webcam

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ABSTRACT

Facial recognition software is a biometric computer application that is capable of identifying an individual by analysing or comparing his/her facial features. This paper proposes to use facial recognition in ATM systems to enhance security. Face recognition begins with an image, attempting to find a person in it. This can be accomplished using several strategies including movement, skin tones, or blurred human shapes. An ATM model that uses facial recognition would protect customers and financial organisations alike from intruders and identity thieves.

Keywords : Face recognition, ATM, biometric, voice modulation, principal component analysis.

I. INTRODUCTION

With the innovative advances in both technology and banking, most bank clients like to utilize Automatic Teller Machines (ATMs) and the internet for carrying out their financial transactions. Customers particularly use ATMs for transactions like withdrawal of money or deposit. However, ATMs also face a number of security and identity theft issues. The use of biometrics, specifically facial recognition in ATMs offer a promising solution to these issues. Biometrics is a computerized methodology to uniquely identify individuals using their behavioural or biological characteristics.

However, these fields have their own set of challenges. For example, the human face is not a distinctive, firm entity. Several instances and circumstances can cause the appearance of the face to differ. These include brightness, posture, ageing, external factors like beard, glasses, hair style etc. Even facial expression influences the face recognition. All these factors affect the accuracy of face recognition. Therefore, in this research, the approach of hybrid face recognition is used. This system is developed using split PCA (Principal Component Analysis) and constant hyperplane for SVM (Support Vector Machine) classifier.

II. Principal Component Analysis

Principal Component Analysis is a statistical algorithm that uses orthogonal conversion to obtain principal components from multidimensional data. The primary principal component is the linear combination of the original scopes that has the highest unpredictability. The nth principal component is the linear combination with the highest unpredictability, being orthogonal to the n-1 primary principal components.
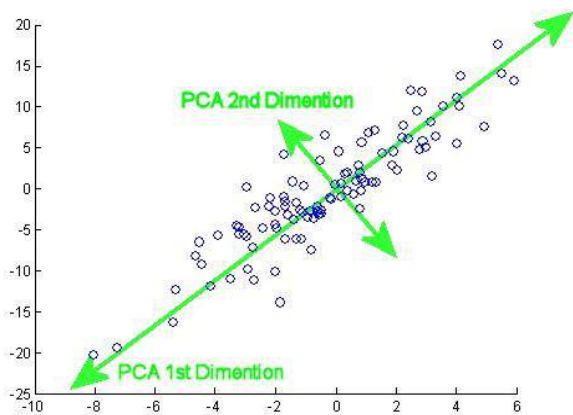
Fig: PCA for Multi-Dimensional data

III. SUPPORT VECTOR MACHINE

Support-vector machines are supervised learning models with corresponding learning models that examine the data used for classification and regression. SVM is a grouping algorithm that intends to split two data sets with maximum gap between them. SVM finds the hyperplane that splits the most sizeable viable group of points of the same class on the same side, while maximizing the gap from either class to the hyperplane.
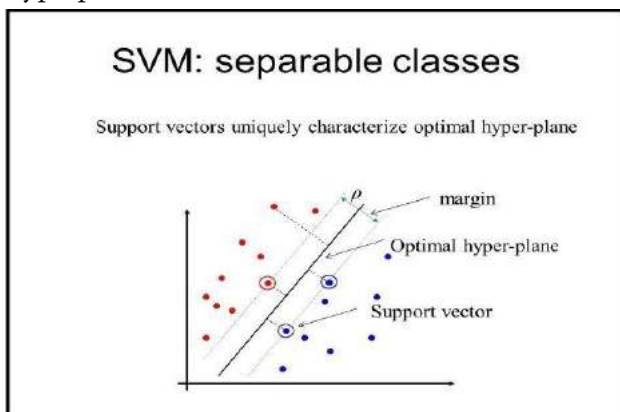
Fig: SVM Class

We modify SVM to face recognition by adapting the understanding of the output of an SVM classifier and designing a illustration of facial pictures that is similar to a two-class problem. To direct our SVM algorithm, we express the problem in a variation space, which specifically identifies the dissimilarities and variations between two facial images.
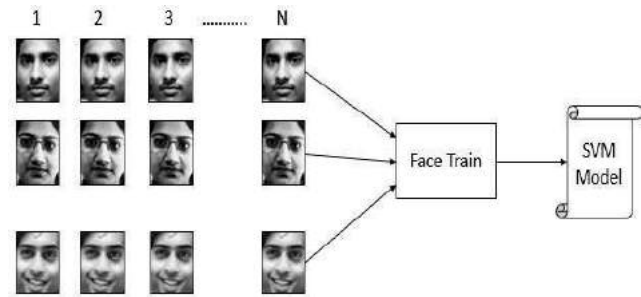
Fig: Processing of Face through Webcam

In variation space, we are concerned about the following two classes: the dissimilarities between images of the same person, and dissimilarities between images of different people. These two classes are the input to the SVM algorithm. An SVM algorithm produces a decision graph which separates these two classes. For face recognition, we re-interpret the decision surface to produce a similarity measure between two facial images. This allows us to generate face-recognition algorithms. To test the ability of the algorithm to identify faces, the algorithms need to be trained on a varying set of faces.

IV. COMBATING AUTOMATED TELLER MACHINE FRAUDS THROUGH FACIAL RECOGNITION ATM TECHNOLOGY

In the recent decade the usage of technology is exponential increased. Through this nonetheless it has made our lives easy but also brought in many fraud techniques. Hence, it there is an utmost need to improvise security in the banking region. Therefore, in this paper a discussion is made about face along with voice recognition, an important field of biometrics which can cut down the number of frauds using ATMs. There are several algorithms being developed among which some have made great efforts to rescue the unsafe situations at an ATM. The two most popular techniques namely are appearance based and geometric based.

A. About Credit Cards:

- Strong algorithms are used to generate PANs

- Storage of card details is done on one protected system

- While communicating PAN is masked

B. About PIN:

- PIN mailers are not usually dispatched with the cards and usually a different medium is used

- PIN selectable options are used to prevent insider compromise

- PINs are masked during usage.

V. PROPOSED METHODOLOGY

I. Partial Synchrony: Partial synchrony may be outlined as follows:

1. Fit an appropriate nonlinear model to each of the two concurrently noted complex cells with interleaving receptive columns.

2. Note the time course of certain logical quantity of the functional mutual input. The input/output designs built for the couple of complex cells would quantify to two precise spike-activity functions, say $f(\vec{x})$ and $g(\vec{x})$, of the strength image $\vec{x}$, as calculated over the merger of the receptive fields. (Feasibly $\vec{x}$ would first be normalized, or otherwise pre-processed. One normal logical measure of functional common input, would be the total of the products of the partial derivatives, i.e. the inner product of the gradients: $\nabla f(\vec{x}) \cdot \nabla g\left(\vec{x}\right)$.

3. Note the time course of the significance of synchronous events in, say, the last one-hundred milliseconds.

II. Principal Component Analysis: It is a statistical algorithm that executes a dimensionality reduction by drawing out the principal components of the multidimensional data.

Method of Finding the principal component:
Find the linear combination of the primary variables with high variance.
The covariance matrix C or correlation matrix R is computed.
The eigen values and eigen vectors of C or R is calculated.
The eigen values e1,e2,e3……ep are computed in descending order.
The corresponding eigen vectors a1,a2,a3….ap are calculated.

$Y_1 = a_{11}x_1 + a_{12}x_2 \ldots + a_{1p}x_p$ is the first principal component

$Y_2 = a_{21}x_1 + a_{22}x_2 \ldots + a_{2p}x_p$ is the second principal component

…

$Y_p = a_{p1}x_1 + a_{p2}x_2 \ldots \ldots + a_{pp}x_p$ is the pth principal component.

1. Choosing principal components:

$$\frac{\sum_{Ei=1} \lambda i}{\sum_{i=1}^{M} \lambda i} \rightarrow \text{threshold}$$

By using this criterion, the requirement of the number of principal components can be determined.

Support Vector Machine:

SVM is a classification algorithm that intends to split two data sets with the largest gap between them. SVM finds the hyperplane that separates the largest possible collection of points of the same class, while maximizing the gap from either class to the hyperplane.

Combining Voice and Facial Recognition:

The system operation starts when the user pronounces a voice password through the mic. If the voice password is recognised, the next step goes to face detection. Using a USB camera interface an image of the face is captured and stored in the database and when the user uses the card again, his image is

captured again and compared with the previous database. If the images match, the access is granted.

Comparison of the facial image is done using Adaboost and PCA (Principal Component Analysis). If the images match, the ID is displayed and the buzzer beeps.

The major steps in facial image and voice recognition are real time image recognition, USB interface, image processing, pronouncing the password and voice processing.

VI. SECURING CUSTOMERS THROUGH FACIAL RECOGNITION

Face recognition software:

1. The face key recognition technology performs the following tasks:

Locates a moving object with a camera view

Determines if the moving object is a face

Compares the live face with samples from database

Face recognition technology works using camera and low- or high resolution CCTV cameras.

Face capturing technology: Face finding technology captures all the faces in a cameras view. Then is stores each image in a separate folder for quick reviews-or for use with another face key technology. Each face

is saved with a time and date stamp. In addition to faces, facial profiles and images of human bodies can be captured and stored.

Search and Match:

Search and match advisory technology is available to assist in the identification of facial images extracted from the video stream or from a watch list database. This function operates by comparing a subject's photo to a database of faces and selecting the faces from the database which look the most like the subject's face.

Fig: Block diagram explaining the working of ATMs with facial recognition technology

VII. FRAUDS THAT CAN BE PREVENTED BY FACIAL RECOGNITION TECHNOLOGY

Unauthorised financial operations using lost or stolen cards and pin codes which many inexperienced card owners write down on a card or sore the PIN code together with the card.

Fraud based on Trust- The card or its duplicate can be used by a fraudster without the permission of the card owner.

VIII. ADVANTAGES OF FACIAL RECOGNITION TECHNOLOGY

- Delivers a practical and workable solution that addresses the requirements of the regulatory authority Reduces financial risks
- Provides a framework that allows high withdrawal limits to cater for the demands of a cash-focused customer base
- Takes societal responsibility to reduce rising levels of crime Increase customer satisfaction

IX. CONCLUSION

This paper deals with various methods of facial recognition that makes credit card transactions and hence the entire finance world more secure. The

principles, basics and physics behind the working of the human eye and image processing inside the human brain i.e., invariant and selective vision, is used to improve the working of the webcam and hence make systems based on facial recognition more effective. The problems in facial recognition may also be solved using the method of split PCA which employs mathematical procedures and dimensionality reduction. Multi-biometric security systems may also be used in credit card readers i.e., facial recognition (spectral analysis) using Matlab and voice recognition using ARM. This paper therefore deals with methods and procedures that make credit card transactions secure and fool proof.

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Game Playing Agent Using Artificial Neural Network

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ABSTRACT

The project focuses to train a game playing agent to learn the game. AI comprises of the neural systems ANN where the neural system produces the controls for playing the game. Based on the Reinforcement Learning technique selections are done subjecting on the information which is collected from the environment. Here, Q-Learning is used where the agent decides the actions based on conditions. Here, the interface Unity SDK is used to build the game.

Keywords : Machine Learning, Artificial Neural Network (ANN), Reinforcement Learning, Q-Learning

I. INTRODUCTION

This paper outlines the introduction of the project Game Playing Agent Using Artificial Neural Network. Neural Network is the basic part of Machine Learning. This game consists of an environment which has two players i.e. an Agent and a Human Player. Here, Agent is the Neural Network which understands to learn the game on its own.

Agent can be grouped into two particular stages i.e. Training and Testing. The Agent will start learning when the user begins the procedure in the command prompt. In Training, in order to obtain the experience an Agent will learn the game by learning through itself. Initially, the score generated will be zero. The repetition is settled to any value.

Every repetition the mean award is estimated. When the Agent starts learning through its experience the award will be increasing to its maxima. When the game ends the award generated will be maximum. After the Agent is trained, the trained values are obtained from a file. The values which are trained are transferred to a model called tensor-flow. During Testing, the Agent is tested on gaming platform Unity SDK depending on the performance of the game play.

Using Reinforcement Learning technique, the Agent will play the game repeatedly and for every game played a rewarding system will reward the action. A Human Player plays the game on their own and as much as possible tries to improve the score. Humans can use the controls using the keys. Every game played by the human is used in the training set. Simulated game will be used to They send the control of the game to the controllers where the controls are generated and provide it to the environment.

II. ARCHITECTURE OF THE PROPOSED MODEL

The architecture diagram shows how the components of system are related to each other. The Figure 1 describes the architecture of the model. The

game can be played by a human player and a trained agent. For the human player to play the game the controls are sent through the keyboard.

The agent is first trained using random values initially. Based on those values certain actions are performed in the game and the reward is calculated and updated in the Q-table. The trained model is saved in a file and and the same file is loaded before the agent plays the game.
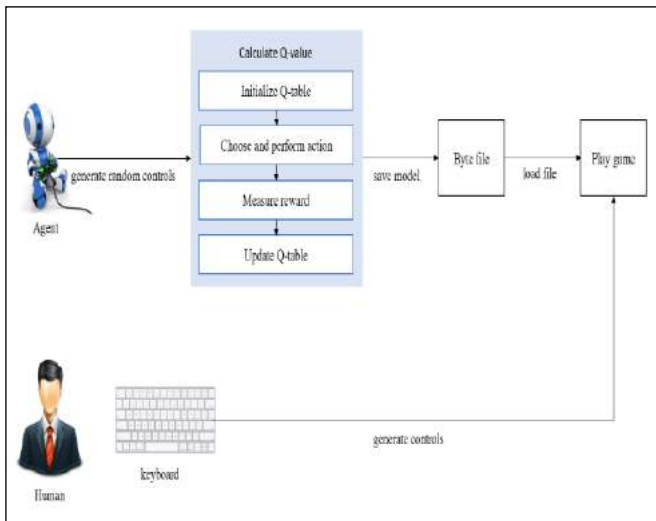
Figure 1: Architecture Diagram

The dataflow diagram in Figure 1 gives a representation of the flow of statistics throughout the system. The game has two phases - training phase and testing phase. In the training phase, random controls are generated to change the state of the game. Feedbacks are received in terms of reward for every action performed when the controls are generated. These values are updated in the Q-table. Q-table basically is made of lookup values for

This is an iterative process, after multiple times of learning to play the game and the model is saved in the file. During the training phase, the saved file is loaded before beginning the game. The trained values are used to play the game by the agent and improve the rewards.

III. METHODOLOGY

Q-Learning

The strategy is used to maximize the values expected of the award, beginning from the present state. The objective of Q-learning is to get a procedure which advises an agent what moves to make under certain conditions. The strategy is used to maximize the values expected of the award, beginning from the present state. It is utilized to store the information in the tables.

The Reinforcement learning techniques is adopted out to the activities resulting, which gives feedback as a reward. In the game, Agent sends the controls to the controller which creates the controls for the game and offers it to environment. The environment changes the condition of the game and updates the q-table. The condition is sent back to the Agent with the q-value. Agent will then update the q-value in the Neural Network and the last outcome is sent to the file to store the trained data.

The Q-learning is mainly based on operating the q-table with the q-values. Whenever the Agent learns the game the agent will be in a remarkable state which represents the present condition of the agent. The agent is provided with the information about the various states in a game. Based on certain action the agent will go to the next state. Here the learning agent will try to take more number of awards rather than punishments. The environment will change the state and also refreshes the q-values until the life exists of the agent.

Pseudocode for Q-learning

1. Initializing the q value
2. Choosing from the q table
a. Choosing a policy which is derived from Q
b. Taking actions
3. Performing the actions
4. Rewards are collected
5. Q-values updated

In a q-table, the rows stipulate the activities and columns stipulates the conditions. Each Q-table score will be the greatest expected future reward that the agent will get in the event that it makes that move at that state. This is a repetitive procedure, as to make the Q-Table better at every point. The Q function takes two inputs that is actions and states. There is a

repetitive procedure of updating the values. As we investigate the earth, the Q-work gives us better and good approximations by updating the Q-values in the table.

Q-Learning is statistically based on reinforcement learning used to find the optimum value of action policy using a Q function approximator. The goal is to increase the values in the function. The Q table finds out the action for each state. The reinforcement learning is usually a time-consuming task as it requires several runs of the same program or task. After that the results are stored. These results are then utilized to better the future run of the program. The game under observation here would benefit from the same learning strategies and will be easily played by agents. The entire operation rests on the reward promised to the agent after every successful run of the trial run.

IV. RESULTS AND ANALYSIS

To analyze the utility of reinforcement learning, the trained values are fed into Tensor Flow, a google open source modeling platform for all machine learning libraries. Tensor flow uses data flow graphs to record the usage of different graphs. These then are altered or modified as per the data fed into it through data sets. After several runs, the data graph is as below for the number of repetitions and mean award.
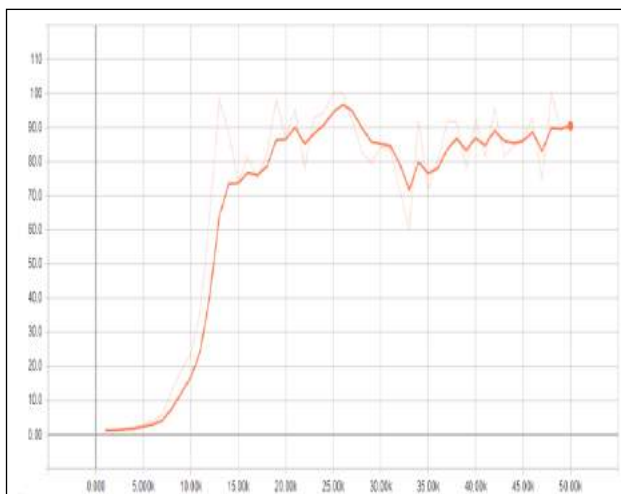
Figure 2: Cumulative Reward

X axis stipulates the number of repetitions and Y axis stipulates the mean award. It is noticed after the graph plotting that after every repetition the mean award will be increasing. This mean award towards the end shall be used to stipulate the game behaviour and will get the training data to show the game learning mechanism.

V. CONCLUSION

The proposed system trains the game playing agent to play the game using the trained value to improve the mean rewards in the game. For future work, we propose trained game playing agent for pre-existing games which has high rewards. Also, the below outputs can be looked into for improvement in the future.

1) The iterations can be speeded up depending on how fast the agent learns. Even a small improvement in iteration time can result in big impact on the reinforcement learning.

2) The game used for learning can be divided into better levels which can test the agent's ability to learn harder game movements.

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A Novel Approach to Share the Online Shopping Cart Items in the E-Commerce Apps with Anyone

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ABSTRACT

The practice of buying items or services over the Internet is termed as online shopping. Online shopping has expanded in size and popularity over the years, certainly because people find it convenient and easy to negotiate shop from the ease of their home or office. One of the most exciting feature about online shopping, is it relieves the need to wait in long lines or search from store to store for a particular item particularly during a holiday season. Online shopping has revolutionized the business world by making everything anyone could want available by the simple click of a mouse button. Local retailers are attempting to expand their footprints by offering goods for sale via online shopping so as to better compete with the likes of Amazon.

As updated on May 2019 Ecommerce is anticipated to be the largest retail channel in the world in just three years. People aren't just spending more time shopping online, Ecommerce statistics say they're spending more money each time they shop online. Statista forecasts that consumers worldwide will spend up to $4.8 trillion online in 2021. In this paper I propose a novel concept to share a cart from your device to anyone else's due to the situations detailed in this paper. It serves a great use to the user's and makes using online shopping more sensible, economical, fast and more digital.

I. INTRODUCTION

Online shopping has expanded in size and popularity over the years, certainly because people find it convenient and easy to negotiate shop from the ease of their home or office. One of the most exciting feature about online shopping, is it relieves the need to wait in long lines or search from store to store for a particular item particularly during a holiday season. Online shopping has revolutionized the business world by making everything anyone could want available by the simple click of a mouse button.

Below are the 6 Ecommerce statistics provided by the leading organizations:

87% of shoppers today use Ecommerce reviews to decide whether to buy, and 77% of those shoppers buy online.

1.92 billion People will buy something online in 2019.

Ecommerce is only about 5% of Omni channel spending, but it's responsible for 40% of its growth.

Only 26% of the small business market has tried to create their own online Ecommerce store.

71% of consumers who've had a good social media experience with a brand are likely to recommend it to others.

72% of Ecommerce will take place on a mobile device by 2021.

So, is there any strong reason as to why has there been such a major increase in online retail and Ecommerce activity? The answer is Simplicity. Shopping online has become more meaningful, convenient, and practical. Customers have the freedom to purchase Ebooks, clothing, and more from all over the world from their place using tablets, smartphones, and computers. They can even collect feedback from other customers across the world. With a few clicks of a button, they can have quality goods and services delivered straight to their door instantaneously.

US Ecommerce Statistics

Roughly eight-in-ten Americans are now online shoppers: 79% have made an online purchase of any type, up from only 22% back in 2002.

Projections say there will be 224 million digital shoppers in the United States in 2019.

77% of US small businesses use social media for key business transactions like sales, customer service, and marketing.

23% of Americans say they shopped more online in 2018, and 11% say they plan to increase their online shopping in 2019.

US Ecommerce sales are estimated to be $690.84 billion by 2020, increasing to $891.7 billion by 2022.

47% of online buyers in 2018 said free shipping was the deciding factor when choosing who to buy from online.

Websites with more than three seconds of loading time lose 40% of their initial website visitors.

Advantages of online shopping

Provided the fast growth of technology, organizations have transitioned over from the traditional method of selling goods to electronic method of selling goods. These organizations use internet as a main vehicle to conduct commercial transactions online. Below are the most trivial advantages of online shopping.

1. Accessibility of online shopping

Consumers can purchase items from the comfort of their own homes or work place. Shopping is made easier and convenient for them through internet. It is also easy to cancel the transactions when the consumers change their mind.

The following points depict the factors which motivate the online shoppers to buy products online.

1. Saves time and efforts.
2. Convenience of Shopping at home.
3. Wide variety / range of products are available.
4. Good discounts / lower prices.
5. Get detailed information of the product.
6. We can compare various models / brands.

2. Availability of online shop

The mall is open on 365 x 24 x 7. So, time does not act as a barrier, wherever the vendor and buyers are.

3. Online shopping saves money

To attract customers to shop online, e-tailers and marketers offer discounts to the customers. Due to elimination of maintenance, real-estate cost, the retailers are able to sell the products with attractive discounts through online. Sometimes, large online shopping sites offer store comparison.

4. Online tracking

Online consumers can track the order status and delivery status tracking of shipping is also available.

5. No pressure while shopping

Usually, in stores, the sales executives try to sway the buyers to buy the product. There can be some kind of inconvenience or pressure, whereas the customers are not pressurized in any way in online stores.

6. Comparisons

Companies display the whole range of products offered by them to attract customers with different tastes and needs. This enables the buyers to choose from a variety of models after comparing the finish, features and price of the products on display, Sometimes, price comparisons are also available online.

7. Online shopping saves time

Customers do not have to stand in queues in cash counters to pay for the products that have been purchased by them. They can shop from their home or work place and do not have to spend time traveling. The customers can also look for the

products that are required by them by entering the key words or using search engines.

Role of technology in online shopping

A study of the 2017 e-commerce trends, shows that over 51% of Americans prefer online shopping. The rewarding nature of the e-commerce market is luring an increasing number of ventures to this domain.

However, in order to prosper amidst the unsparing competition and make their business successful, marketers need to focus on offering an unparalleled shopping experience to their customers. Technology has always come to the rescue and it has changed the manner in which retailers and customers interact, enabling marketers to build their online brand image and justice.

Below are six ways in which digitization and retail technology are changing the future of online shopping:

1. Cross-Channel Purchases

According to the UPS Pulse of the Online Shopper 2016, 38% of all purchases are made through multiple channels. Technology and social media are central to omnichannel shopping. Shoppers are conducting online product research using mobile applications and going through the social media ratings, online customer reviews, brand promotion videos, and product photographs submitted by other users.

Consequently, shoppers use multiple channels to make a decision, selecting the products and services with fluidity. In order to ensure consistent profits, e-commerce retailers must improve their digital presence across a variety of channels.

Retail technology is revolutionizing online shopping by enabling businesses to adopt innovative ways to engage their customers. Keeping up with this tech will separate the leaders from the laggards.

2. High Supply Chain Efficiency

The present-day customer tends to have a 'buy-now' mindset and expects a faultless service through the entire life-cycle of the order.

An annual study published in the Future of Retail 2016, shares that in recent times customers expect seamless and quick shipping, delivery, exchanges, and returns from e-commerce firms. Consequently, retailers need to focus on improving their customers' shopping experience rather than merely increasing their customer base.

Retail technology is helping e-retailers improve their supply chain and logistics using the lean methodology to streamline these processes and eliminate inefficient operations.

Supply chain practices such as cross docking, direct delivery to stores, real-time delivery, third-party logistics, and cross-functional integration are playing a major role in making the business processes more efficient.

Logistics and omnichannel order orchestration offer retailers data on the real-time orders, inventory visibility, order aggregation and fulfillment, and customer service, enabling them to optimize their supply chain systems.

3. Artificial Intelligence

According to a study presented by Gartner, an American research firm, by 2020, 85 percent of customer interactions will be managed using Artificial Intelligence (AI).

Owing to its expertise in delivering a customized experience, retailers are increasingly employing Artificial Intelligence to stay above the competition, such as chatbots designed to simulate conversations with online customers.

Moreover, AI is being increasingly used to handle customer data, analyze and influence customers' buying behavior, prevent fraudulent transactions, and predict consumer behavior, enabling online retailers to automate their businesses.

For instance, Amazon's virtual assistant, Alexa, offers e-commerce retailers a creative opportunity to influence customer preferences. Upon receiving a voice request, Alexa recommends products, arranges transport, and orders meals for the user, impacting the way a customer makes a purchase.

4. Dynamic Pricing Strategies

The online retail market is highly price-sensitive and competitive. Dynamic pricing is a strategy used by e-retailers whereby the price of the products or

services offered are changed depending upon the supply and demand. Simply put, it is a flexible pricing strategy that allows retailers to alter the prices of their commodities based on internal (inventory and sales targets) and external (competition) factors.

When a retailer notices a fast-moving product, he/she will temporarily increase its price to avoid complete depletion of stocks. Similarly, when a firm's sales targets are high, it may choose to push sales by offering a lower price on its products.

Dynamic pricing also enables firms to monitor their competitors' pricing strategies, helping them make sound pricing decisions. For instance, if its competitor's stocks are low, a firm can choose to increase the prices, boosting its sales and profits.

The real-time price changes significantly impact the bottom-line of the e-commerce firms; consequently, dynamic pricing strategy is a must for the online shopping market.

5. Behavioral Analytics

With mobile users becoming increasingly comfortable with online shopping, web analytics and customer behavioral analytics are gaining importance.

Customers prefer to do an online research on products and services. However, they expect e-retail stores to offer them an array of options with respect to their preferences and buying behavior. Online business analytics offer rich data on the customer behavior trends, helping retailers improve merchandising, supply chain, marketing, advertising, and other strategic decisions.

Behavioral analytics tracks shopper's search and purchase history and their interactions with the customer care professionals, offering a wealth of information to online marketers. This data enables retailers to predict and suggest the relevant products and services to their target customers.

6. Smartphone Shopping

Market research conducted by comScore Inc. revealed that more than 86 million Americans use their smartphones for online shopping. The study found that four out of five smartphone users do a thorough research on the products and services available online before making a purchase.

Smartphones have become the default screen for brand engagement and e-commerce transactions, making it crucial for marketers to maintain a good online reputation and offer fair pricing strategies. To drive their business growth, marketers must strive to make the mobile shopping experience enjoyable, informative, and convenient for their customers.

II. PROBLEM STATEMENT WITH ONLINE SHOPPING

With all the advantages and strength of the online shopping given above, is there any gap between the organizations and the consumers in any way? It's hard to point out any significant gap that needs much attention. With the help of the above mentioned technologies the online shopping is on cloud nine and it's going unstoppable. However, some more uncommon disadvantages of online shopping are given below:

In this paper I have tried to point out not a disadvantage of online shopping, but a significant gap which is often felt by the potential users. This happens when a user has added items to his cart and he is unable or don't want to place the order for several reasons. The reasons can be as follows:

He/she doesn't have attractive offers on his credit/debit card than his/her friend's whose credit/debit card has good offers at that moment.

User A's internet connection is slower so he wants his friend B to place the order from B's mobile.

User A has no time to select the items so user B has done on behalf of user A but at the end user A will book the final list from his mobile just by reviewing the items selected by user B.

There can be many more situations similar to the above mentioned ones but however in all such situations what we feel is that we don't have a feature to share our cart with our friends or someone who we know.

Now the question is how to share the cart?

We have to manually tell what is there in our cart and the other person will manually add those items to his cart.

We take a snapshot of our cart and the other person again manually adds those items to his cart. The above mentioned ideas don't serve the purpose of what is called as "sharing the cart." In this paper I have discussed the concept of sharing one's cart with someone else to complete the transaction.

III. RESULTS AND DISCUSSION

A device-implemented method of sharing an online shopping cart from one user's device to antother user's device over a computer network includes the steps of providing the phone number of the share, the sharee being a person with whom the shopping cart is shared. One of a plurality of predetermined roles may be specified for each sharee, each of the plurality of roles defining privileges granted to the sharee. A notification such as a text message or an email, may then be sent to the sharee's email or his mobile, the cart number, and the cart items. The sharee may then retrieve the saved shopping cart over the computer network by accepting the notification send by the sharer from his device. The sharee may then exercise only those privileges defined by the role specified for the sharee. The roles may include, for example, "checkout", in which the privileges granted consist of completing the transaction by the share from his account. The detailed flowchart consisting of the steps is given below.

Flowchart depicting the steps of cart sharing concept.

CREATE CART
OPTIONALLY INCLUDING;
ITEMS SELECTED FOR THE PURCHASE,
BILLING INFORMATION,
SHIPPING INFORMATION, PAYMENT
INFORMATION,

↓

PLACE SELECTED ITEMS IN CART

↓

LOGIN (IF NOT ALREADY)

↓

SELECT SHARE CART OPTION

↓

ENTER THE MOBILE NUMBER OF THE SHAREE

↓

THE NOTIFICATION POPS UP ON THE SHAREE'S
DEVICE (HIS DEVICE SHOULD ALSO
HAVE THE SAME APP)

↓

THE SHAREE CONFIRMS THE SHARE
AND SAVES THE CART IN HIS DEVICE

↓

SHAREE RETRIEVES AND VIEWS THE CART

↓

SHAREE PERFORMS ALLOWED ACTIONS
DEPENDING UPON ROLE GRANTED

↓

THE TRANSACTION IS OVER

IV. CONCLUSION

This paper discussed an innovative approach of sharing the online shopping cart with the users of their choice for several reasons. The sharee upon accepting the cart from the other user completes the transaction from his account. This can be useful when the original user has slow internet speed, no offers on his credit/debit card, no delivery to his address and so on. It thus makes online shopping experience more convenient, more robust and gives a new exciting feature for the shopping apps.

Efficient Buildings – A Key Element to Build Smart Cities

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ABSTRACT

The use of AI and ML plays a pivotal role in optimizing work flow and productivity and also being cost effective for companies. Artificial intelligence and machine learning can be used to do work that consumes an employee's time that could be used to work productively and focus on higher value work. AI can be used to extract new data and analyze the market for improved business outcomes. It has been statistically proven that using this technology has provided a competitive edge on the business forefront. Security can be heightened and be made safer with the use of fraud detection methods which results in a safer working environment, further providing comfort to the company's employees. Companies will be able to smartly power machinery, vehicles, structures and enhance customer intimacy therefore increasing customer demand. Understanding customer behavior, wants and needs plays a crucial role in what a company's next move should be and this can be improved using artificial intelligence services

Keywords : Smart Cities, Harvesting, Artificial Intelligence, Machine Learning

I. INTRODUCTION

The future of efficient buildings lies in the fields of artificial intelligence and machine learning, both playing a vital role in adding the term "smart" to efficient buildings. The recent expansion of IoT devices and their convergence with cloud-based technologies is making it easier to generate data about building performance – creating a prime opportunity for building owners to apply AI and ML to make critical operational and financial decisions. Employees lose around 1.5 hours a day of productivity due to distractions because they are either thinking about the discomfort instead of focus on the task at hand or may start wasting time on behaviors to cope with their distress. Either way, the problem costs large enterprises or office tenants millions a year in lost productivity. Mobile apps and

wearable devices are solving the problem by enabling occupants to connect directly with building operators. Building owners can now directly understand how occupants are using the building and assess their comfort levels through direct tenant feedback. The data collected from these devices can be added as variables to AI to build advanced models of how a building performs to achieve its higher worker productivity which in the long-run results in tenant retention and other benefits for building owners.

II. AUTOMATED POWER FOR EFFICIENT BUILDINGS

Building automation is the process of monitoring and controlling all the systems in a building's which include but are not limited to mechanical systems,

security systems, fire and flood safety systems, heating systems, cooling systems and ventilation systems. The building's occupancy and energy demanded is measured during a small interval of time and the systems in the building are controlled using a centralized system, this system has access to all the systems mentioned above.

III. COMPONENTS OF A BUILDING AUTOMATION SYSTEM

Controllers – are the components that gather the data from the system's sensors (both analog and digital) and determine how the system should respond.

Sensors - The sensors are the devices that collect data throughout your building, from temperatures and humidity, to CO2 output and even room occupancy.

Output Devices - Once the controllers have gathered the data and determined what course of action the system should take, the commands are carried out by the system's output devices, such as the relays and actuators.

Communication Protocols - Communication protocols refer to the language used by the various components of the building automation system to communicate with one another.
User Interface - The user interface is required to interact with the building automation system by monitoring the data reported as well as accessing systems remotely to change settings if desired. The user interface is generally accessible remotely via a mobile device such as a smartphone, tablet or laptop.

IV. BENEFITS OF A BUILDING AUTOMATION SYSTEM

Reduce Building Expenses - Building owners can expect to save a substantial amount of money over the long run with a BAS. Building automation systems especially help save on utility bills, including energy costs.

Improve Comfort and Productivity - By improving the control of the indoor environment, there will be more control over the comfort of the building's occupants. Not only will the building be heated and cooled more effectively and efficiently, air ventilation and quality will improve as well, which is likely to have a big impact on the productivity of employees or students.

Reduce Environmental Footprint - Because a building automation system reduces energy usage, its implementation will immediately make the building more environmentally friendly. By reducing energy consumption, it will reduce the building's output of greenhouse gases. This is one of the reasons air quality will improve.

V. FLOOR PANELS TO GENERATE ELECTRICITY

The piezoelectric effect has been known for more than a century. The concept of piezoelectric flooring is a relatively new concept. A piezoelectric flooring generates and harvests electricity with each footfall. Although this concept is relatively new, it has stirred a great degree of interest in the sustainable energy circles.

Piezoelectric floor panels can be created as an invisible structure that is integrated into the floor. This structure will feature easy maintenance and will be eco-friendly in nature thanks to its recyclable components.

A piezoelectric tile is expected to generate around 4 watts of energy with each step. Around 12 tiles installed at the entrance to West Ham station generated enough energy in the day to power the station lighting by night.

Another concept is that when a person steps on the tiles that constitute a floor, the former flexes by approximately 10 mm, an action which is then converted into around 15 to 25 watts peak. According to engineering.com, the generator used in this innovation is not piezoelectric in nature.

VI. WHAT IS PIEZOELECTRIC EFFECT?

When compressed or tensile stress is induced in a material, an electric field is generated across it, creating a voltage gradient and a current. Piezoelectricity is electrical energy harvested from mechanical pressure such as walking motion. When pressure is applied on an object, a negative charge is created on the expanded side and a positive charge is created on the compressed side. As this pressure is relieved, electric current flows across the substance. Crystals, plastic and ceramics are some of the materials that exhibit the piezoelectric effect.

VII. APPLICATION OF PIEZOELECTRIC FLOORS

Piezoelectric flooring is ideal for places that receive heavy foot traffic. It can be installed at tourist attractions, townhalls, schools, stadiums, or dance floors. In fact, the firm Energy Floors has a product called the Sustainable Dance Floor especially designed for clubs. Piezoelectric flooring can also be installed in other busy places such as subway stations, airports, universities, and malls.

Given that the technology of using floor tiles to generate electricity using mechanical pressure is relatively new, companies in this sector are still looking for venture capitalists and investors. It would also be interesting to see if automotive companies develop an interest in this technology to harvest electricity from the movement of cars and other vehicles.

VIII. RAINWATER HARVESTING FOR SMART BUILDINGS

In a country such as India, where a large source of its income originates from agriculture, one major resource required for the flourishing of said agriculture is the need for water. Another few areas of concern lies with the requirement of water for livestock and human consumption and even for storage of water of rocks on the ground. Rainwater harvesting is collected in the containers before raining down to ground level and collecting it.

In today's modern architecture and infrastructure smart buildings are the talk of the hour. It requires the incorporation of various new technologies, IoT being one such technology. Surcharging of stormwater drains is a problem that is exacerbated by intense rainfall and increasing development. Existing stormwater sewers become overloaded and surcharged, causing localised flooding incidents. If the stormwater discharges to a combined sewer then surcharging causes foul water to flood, which would have health implications as well as the potential to cause damage to property. Rain water harvesting can help reduce flood risk, save energy/carbon emission (at least that associated with the displaced water) and save money.

IX. WHAT IS RAINWATER HARVESTING?

Water is our most precious natural resource and something that most of us take for granted. We are now increasingly becoming aware of the importance of water to our survival and its limited supply.

Rainwater harvesting (RWH) is a simple method by which rainfall is collected for future usage. The collected rainwater may be stored, utilised in different ways or directly used for recharge purposes. With depleting groundwater levels and fluctuating climate conditions, RWH can go a long way to help mitigate these effects. Capturing the rainwater can help recharge local aquifers, reduce urban flooding and most importantly ensure water availability in water-scarce zones.

X. APPLICATIONS OF IOT IN SMART BUILDINGS

One such proposal of is the use of Arduino which provides a number of digital and analog inputs which is used to connect to the computer and for

communicating among systems using a standard protocol. It is highly effective as it is efficient, accurate, cost efficient and easy to use. With the help of an ultra-sonic sensor, stepper motor, water level sensor and the rainwater sensor has been connected along with the Arduino micro controller in order to take readings and take the appropriate measures accurately which could not be achieved by humans due to natural human error. A water sensor can detect water accumulation during the time of rain which can then in turn have a gate opening to the water collection pit. A water level sensor present in the pit can monitor the water levels and once it is filled, with the help of a GSM (Global system for mobile communication) module a water board can be notified thereby closing the pit.

We can conclude from this that Internet of Things (IoT) addresses the network perspective of rainwater harvesting. Peer to peer communication defines future internet addresses of rainwater harvesting. Further monitoring can be done using IR sensors or cameras to detect integrity of the pit and check for faults or damages occurred over time.

XI. REDUCING ENERGY CONSUMPTION IN BUILDINGS

Commercial buildings aren't known for their energy efficiency,MIT researchers have found that as much as 30 percent of commercial building energy is wasted. But the potential energy savings within commercial buildings today are enormous. This is especially true when looking at how much energy is being wasted and how much of that could be reduced by creating smarter buildings. Taking advantage of the latest building automation and building management systems we can reap incredible energy savings in many areas, including HVAC, lighting, as well as operationally.

The major areas of energy consumption in buildings are:
- HVAC (heating, ventilation, and air conditioning)—35%
- Lighting—11%

Thereby by finding methods to reduce the energy consumption of HVAC and lighting, we can reduce the total energy consumption of a building by almost half.

XII. HVAC and Lighting

With HVAC systems and lighting accounting for nearly half of a building's total energy usage, they present two areas where the highest reductions and savings can be achieved, ideally by using a building automation system. Automated controllers help facility managers optimize HVAC efficiency, with temperature and humidity sensors set to optimize heating and cooling systems, and motion and occupancy sensors working with thermostats, lighting, and security.

Machine Learning algorithms can be used to monitor total usage over period and compare against the same time period, by year, month, day or hour. Machine Learning also enables data processing and analysis of all the building (s) data and it is capable of recognizing patterns or anomalies that can lead to insights, savings, and greater efficiencies.

XIII. CONCLUSION

The use of AI and ML plays a pivotal role in optimizing work flow and productivity and also being cost effective for companies. Artificial intelligence and machine learning can be used to do work that consumes an employee's time that could be used to work productively and focus on higher value work. AI can be used to extract new data and analyze the market for improved business outcomes. It has been statistically proven that using this technology has provided a competitive edge on the business forefront. Security can be heightened and be made safer with the use of fraud detection methods which results in a safer working environment, further providing comfort to the company's employees. Companies will be able to smartly power machinery, vehicles, structures and

enhance customer intimacy therefore increasing customer demand. Understanding customer behavior, wants and needs plays a crucial role in what a company's next move should be and this can be improved using artificial intelligence services.

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Automatic Reportage of Accident Zone to the Emergency Vehicles Using Smart Route Framework

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ABSTRACT

With this mechanical and open impact, the utilization of vehicles has immediately expanded and in the meantime the frequencies of accidents have similarly widened. It's not possible for anyone to dismiss the accidents, yet can save their life by pushing the ambulances to the specialist's facilities in time. In this paper accidents revelation and course of emergency vehicle using IoT is arranged. The objective of this set up is to confine the deferral caused for development of crisis vehicles. This way to deal with boot intends to offer the accident spot to crisis vehicle using GPS that is open in salvage vehicle

Keywords : IoT, Accident,Emergency Vehicles.

I. INTRODUCTION

Presently a days, on the planet the populace is expanding step by step as the populace builds the quantities of vehicles on the streets and roadways additionally increments. Because of this, the event of the accidents and congested driving conditions likewise be expanded. This module gives the data about accident to the rescue vehicle and clinic. Subsequently, this unexpected assistance will spare the open life and diminishes the roads turned parking lots. To upgrade the degree of supervision and organization for burden transport vehicles, especially trucks which are conveying coal it is crucial to make transport vehicles remote watching module. The cloud will be ceaselessly sitting tight for the data from the framework which should record position of the vehicle. The cloud contains the data about speed and position of the vehicle. The smart traffic light controller that was acquainted with recoveries the holding up time and maintains a strategic distance from the traffic load. In nowadays the Wireless Sensor Networks (WSN) will be connected in various territories like human services checking, climate observing, home computerization, military, wellbeing and security, etc. Worldwide situating framework (GPS) is utilized by the satellite-based route, which is utilized to get and send the sign and it will serve the customer with required information. The cloud will send the accurate area and position of the vehicle to emergency vehicle through the mail. With the assistance of GPS and cloud vehicle is followed. The RF Transmitter and RF Receiver is used for crisis vehicle rescue close signal.

II. LITERATURE SURVEY

Abid et al. [2] depicts that there were 33,000 causalities in 2009 and due to engine vehicle crashes there are 2.2 million exceptional injuries in the United States. These accidents influence the overall

population financially and procure a yearly measure cost of $230 billion dollars. Every single individual burned through $750 dollars in USA. What's more, the roadway blockage will cost $78 billion yearly.

Olaru and Eltoweissy et.al. [7] Portrays a creative and ground-breaking thought of including Mobile Ad-hoc Networks (MANET) for street and roadway correspondences using front line imaginative movements known as Vehicle Ad-hoc Networks (VANET). The VANET uses a blend of Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) interchanges, for driver notice ahead of time of traffic occasions. In V2V structures, each vehicle is accountable for prompting the closeness of an event in light of reports from various vehicles. This framework will provoke all around dealt with security ambushes by checking incorrectly enlistments, which convey more noteworthy plausibility and a more blockage likelihood of serious dangers.

Abid et al. [2] depicts that there were 33,000 causalities in 2009 and in view of engine vehicle crashes there are 2.2 million one of a kind injuries in the United States. These accidents influence the overall population financially and gain a yearly measure cost of $230 billion dollars. Every single individual burned through $750 dollars in USA. Also, the roadway blockage will cost $78 billion yearly.

Olaru and Eltoweissy et.al. [7] Portrays a creative and amazing idea of including Mobile Ad-hoc Networks (MANET) for street and roadway correspondences using cutting edge inventive movements known as Vehicle Ad-hoc Networks (VANET). The VANET uses a blend of Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) interchanges, for driver notice ahead of time of traffic occasions. In V2V systems, each vehicle is accountable for instigating the closeness of an event in light of reports from various vehicles. This framework will provoke all around dealt with security strikes by checking incorrectly enlistments,

which convey more noteworthy plausibility and a more blockage likelihood of serious perils.

Haisong Chen et al. [8] depicts about a accident discovery utilizing GPS, GSM and ARM. The vehicle state is transmitted and gotten by this proposed framework and different necessities of the client upon the event of the accident to the medical clinic. The framework focuses to accomplish the location of crash in the principal go through, and obtain treatment time for the impact hurt, therefore cutting down the accident mortality, moreover reducing scenes influencing time on the action.

Prashanath Mohan et al. [6] presented a framework which a performs rich identifying by piggy support on cutting edge cell phones that customers pass on with them. The recognizing section uses the GSM radio, GPS, receiver, and additionally accelerometer sensors to distinguish knocks, potholes, sounding and braking. The paper in like manner tends to a couple of troubles, for instance, limitation in the vitality effective manner, discretionary direction and sound discovery.

Sangita N Gujar et al. acquainted a prepared organization framework with screen speed of a vehicle and perceive accident using GPS recipient. Through this proposed microcontroller model, it screens pace of a vehicle, contrasts and the past speed reliably and acknowledge occasion of impact if vehicle rate is underneath the predefined speed. Accident territory is acquired from GPS close by time and in this way advantageous assistance to significant human life can be given. Xu Li et al. [4] MSN for Activity Observing has two sorts of calculations: 1) Linked based, and 2) Vehicle based. In connected based framework calculation, the pair of sensors are utilized in the connection one toward the starting stage and other toward the consummation organize which is the best traffic status reflect of that interface. In inverse the vehicle-based calculations use each available data pair for the thought of the considerable number of associations

set out by them to process a typical speed of traffic. Thusly, the sensors coordinated to a vehicle it can move crosswise over numerous connections and relating more streets. The result amassed can be exact yet having sensors in all of the vehicles moreover on all of the lanes is costly especially when we are contemplating a financially poor country like India.

Faisal Ate al. [9] presented a traffic control model, considering the remote sensor framework and a forewarning framework for the red-light convergence circumstance to alert drivers on various sides to save their lives. This framework relies upon the line length of the vehicles on the action lights. This model additionally speaks to the 4 reenactment models of various pieces of world are utilizes this model. The total outcomes are appeared as vehicles which are not served just because.

Harpal Singh et al. [5] communicates that, the traffic organization is the fundamental issue of the road. Traffic lights expect an indispensable part in rush hour gridlock the board. Current traffic lights take after the destined gathering. Foreordained arrangement traffic lights are known as static traffic lights. The traffic lights in the street are not gifted to count the amount of vehicles and the need of the vehicles on intersection point. In like manner, regardless of whether none of the vehicles are there in the inverse these vehicles should hold up in rush hour gridlock signal intersection. A portion of the vehicles like Fire Brigade and Emergency vehicle are also stuck in the rush hour gridlock signal and should burn through their valuable time.

YogitaJadhav et al. depicts in his find out about the vehicle limitation framework utilizing GSM and GPS administrations. The framework licenses control of the vehicle and transmits the status and position of the vehicle to the owner on his cell phone as a (SMS) short message at his requesting. This composing makes them inadequacy as researcher in certain spots where there is no obtainment of GSM frameworks it

is irksome for correspondence moreover did not say increasingly required information of the moved vehicle security structure with theft control and crash notice and its quality thievery control through GSM short message advantage and sends region as longitude and scope.

Zhang Wen et al has showed up in their examination about the vehicle position, the owner sends a sales through SMS. SMS is sent through the GSM model from the gadget which is incorporated by Spartan processor. The processor sends request to a GPS in the device. The GPS module responds with bearings of the vehicle position. This position (scope and longitude) is sent to the customer as a SMS to the customer with time, date, longitude and scope positions. TANG shuming et al. recommended that CCTV and GPS based accident wraps GSM module to send the scope and longitude of the impact happened spot. The estimation of scope and longitude to the customer could possibly fathomed GPS data yet which comes about no use.

Hu Rufua et al. proposed "radio recurrence" based framework in which accidents can be identified which is kept to a particular locale exactly where if it is distant then it is unreasonable to distinguish the vehicle. Rajesh Kannan Megalingam et al.proposed a accident location framework utilizing video based which is apparently intricate.

Md. Syedul Amin et al. creator suggested a speed based computation which seems to have false alert at whatever point an abrupt brake is associated. Along these lines there is essential to develop a framework with exceptionally less false caution and region deciding framework so anyone can see easily where the vehicle is found.

C.Vidya Lakshmi et al.proposed the deceleration/speeding up, edge of the hit and move over are recognized by MEMS sensor. For the emergency vehicle salvage the gsm model utilized with a RF transmitter in rescue vehicle and RF

beneficiary in sign unit. P. Arunmozhi1et al. For GSM module the sign is significant on the off chance that there is no sign, at that point the GSM module won't work appropriately. This suggests there could be no passage to correspondence, which makes GSMmodules not absolutely strong. Taking everything into account, the Dijkstra's Algorithm was acquainted by various papers with make rescue organizations accomplish the impact spot.

III. PROPOSED DESIGN

The engineering comprises of four noteworthy units which go about as the spine for framework to be specific Vehicle module, emergency vehicle module, cloud database, and traffic control frameworks. The square chart of accident location and insightful route framework for crisis vehicle is as shown in fig 2.1.
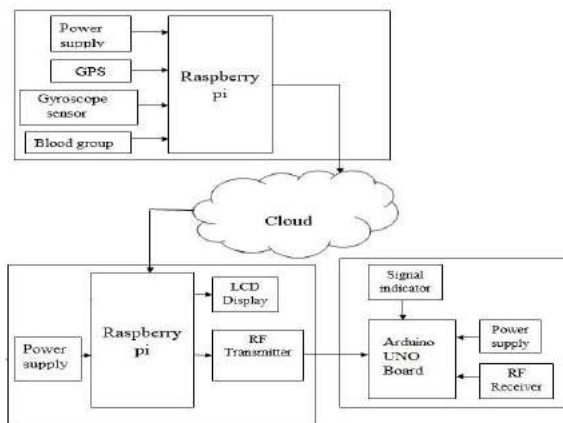
Fig 2.1: Square outline for accident recognition and wise route framework for crisis vehicle

1.Vehicle Module: This framework has gyroscope sensor alongside GPS module which are coordinated in vehicle. At whatever point accident happens GPS follows the present position (scope and longitude). The scope and longitude of the accident spot is sent to cloud which illuminates about the accident to the rescue vehicle and the medical clinic through mail.

2.Ambulance Module: Emergency vehicles are furnished with LCD display and RF transmitter. Cloud sends the scope and longitude to the raspberry pi through the mail. The control sign is transmitted

by the control area to the majority of the sign between the emergency vehicle and the vehicles by the RF transmission.

3. Cloud Database: The distributed storage stores all the data about the blood groups and their contact list. This stockpiling assumes a focal job in the crisis reaction and it is utilized to impart between the vehicle unit and emergency vehicle unit through mail.

4. Traffic Control Systems: The RF collector will get the information from RF transmitter in emergency vehicle nearing the traffic signal. It Controls the traffic signal naturally with the assistance of RF module. At whatever point the crisis vehicle arrives at near the traffic signal (generally 100m), the traffic sign will be made of green by means of RF correspondence. So the emergency vehicle is prescribed to achieve the medical clinic immediately.

5. Traffic Violence identification framework: A framework will be coordinated on the streets with the Infrared proximity sensors which is utilized to sensor an inappropriate passage of the vehicle in One-manner streets. This framework is manufactured utilizing ultrasonic sensor,Micro-controller,Buzzer and LCD.The framework will be incorporated with the four IR closeness sensor with id ,when the vehicles move right way then the sensors will be on in the example of 1,2,3,4 i.e.., the primary sensor will on pursued by the second then third and finally fourth ,yet on the off chance that the vehicle moves in misguided course, at that point the sensors get activated in the style 4,3,2,1. In this way a misguided course section of vehicle will be detected and the traffic station will be cautioned.

IV. PROPOSED ALGORITHM

Created Algorithm is

Step 1: Establish a precise association.

Step 2: Initialize the GPS module.

Step 3: Wait for the danger conditions.

Step 4: If the crash happens then get to the GPS collector.

Step 5: Send the accessed to GPS data to cloud.

Step 6: Cloud sends the data to emergency vehicle and medical clinic through mail.

Step 7: In emergency vehicle instate the LCD.

Step 8: Blood group, latitude and longitude are displayed on the LCD.

Step 9: RF transmitter will begin sending the information.

Step 10: If RF recipient gets the information the red light abandons red light to green light.

Step 11: If RF beneficiary does not get the information it will wait for the information from the RF transmitter.

Step 12: The gathered GPS data from the cloud is additionally sent to medical clinic through the mail.

Step 13: emergency clinic individuals send the message to the separate individuals through cloud.

V. EXPERIMENTAL RESULTS

The robotic car model is as shown in the figure 4.1. The mechanical vehicle model comprises of a raspberry pi board, dc engine and engine driver L293D. L293D engine driver will serves to dc engine for the development of the robot.

Fig 4.1: Robotic car model

The vehicle unit is coordinated with raspberry pi board, accelerometer sensor and GPS. The accelerometer sensor identifies the accident by thinking about the situation of the vehicle. The scope and longitude are found by utilizing the GPS. At the point when the estimation of the accelerometer sensor changes over 45 degrees the scope and longitude worth is will be sent to emergency vehicle unit and medical clinic through mail.
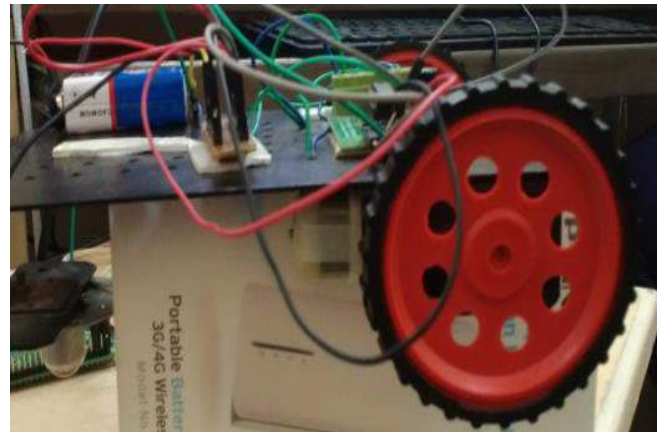
Fig 4.2: Vehicle unit

When the driver begins the vehicle, the individuals in the vehicle ought to enter their blood group. On any chance that any accident happened out at the vehicle,then the position, scope and the longitude of crash happened spot sent to the rescue vehicle and medical clinic through mail. Figure 4.3 demonstrates the showcase to enter the blood gathering. The B+ is the entered blood bunch which has been shown in the work area. The scope and longitude of the crash happened spot is 13.067757 and 77.5045808.
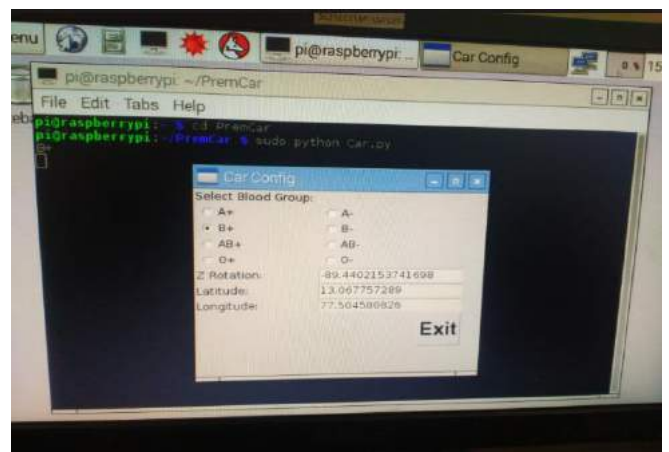
Fig 4.3: People in car entering the blood group
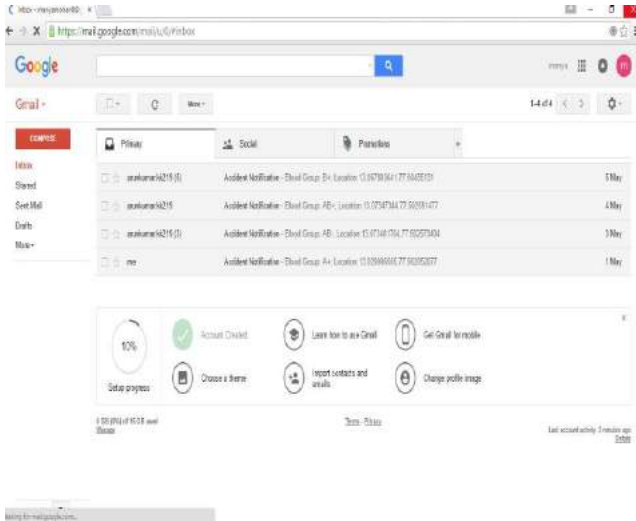
Fig:4.4 Mail sent to ambulance
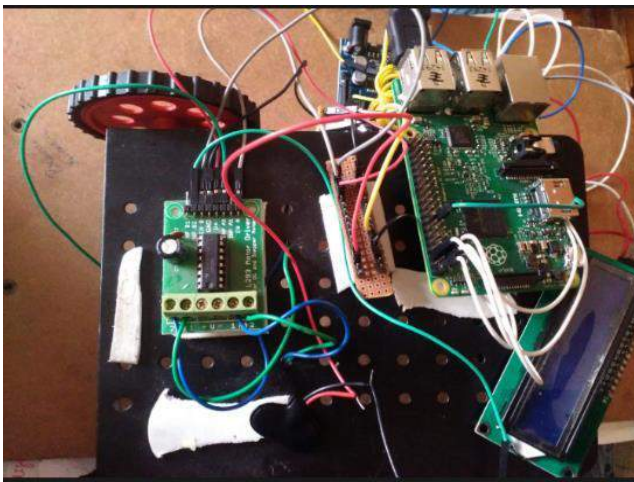
Fig 4.5: Ambulance unit

Figure 4.5 demonstrates the emergency vehicle unit which is incorporated with a raspberry pi board, LCD display, dc engine, L293D engine driver and RF transmitter. At whatever point accident happens mail sent to the emergency vehicle unit with blood gathering and scope and longitude of the crash happened spot. RF transmitter will transmit information sequentially to clear the traffic.

Fig 4.6: Blood group, latitude and longitude displayed on LCD

Figure 4.6 demonstrates the blood group, scope and longitude showed on LCD in a rescue vehicle unit. The blood group of the individual is B+ and the accident spot's latitude is 13.067 and longitude is 77.504.

VI. CONCLUSION

The usage and plan of this model is for traffic the board, so the emergency vehicle on street will get a reasonable method to arrive at medical clinic in least time and immediately from human and vehicle interference. There is a correspondence between the GPS and the cloud which is the fundamental element of this model. This framework utilizes the SaaS and IaaS highlights of the distributed computing alongside the accident recognition. The incorporation between the cloud, vehicle, crisis vehicle and medical clinic are the web and that between cloud mail administration and client.

FUTURE SCOPE

Future extension is to keep up a vital good ways from the vehicle theft by using GPS and cloud. Consistent data logging and assessment will be executed that allows the system to screen development conditions in various territories. Diverse prosperity notification can be issued to the owner of auto if auto crosses certain described speed limits. The nonstop alerts can in like manner be set for the unapproved vehicle improvements and diverse uncommon cases using a movement of geographic zones alongside time sensitive guidelines for the vehicle in/out.

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Data Models used in Bitcoin and Ethereum Blockchain Platforms

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ABSTRACT

Data analytics has captured attention of both researchers as well as business organizations, since a long time now, as the knowledge or information getting analyzed and evolved is priceless in upbringing the business. Blockchain is the latest technology which is getting adopted at a faster rate due to its unique properties. This paper focuses mainly on data models, and some tools used for data analytics being used in blockchain environment. Public blockchain is an open ledger platform which allows to perform data analytics.

Keywords : blockchain, data models, UTXO, data analytics tools.

I. INTRODUCTION

Blockchain a.k.a Distributed Ledger Technology (DLT) has made its own locus in the technological grade, through its evolution since past decade. The highlight of this technology was its ability to provide tamper proof, cost effective asset transaction among multiple parties without requiring a trusted central authority. Blockchain was devised and made public by Satoshi Nakamoto in his white paper "Bitcoin electronic cash system", released in 2008[1]. The concept was in paper only for a year, after which its first application "Bitcoin" got released in 2009. Bitcoin network came into market along with the inception of first cryptocurrency based on blockchain, called the bitcoin. Currently there are quite a lot blockchain based cryptocurrencies, more than 1600 in count and still growing, called alt-coins. Not only the digital currency world but several other usecases of blockchain came into existence[]. These developments have enkindled public interest in Blockchain technology.

Along with the inquisitiveness about the features provided by the blockchain technology, it got adopted fast in the research area and application development zones related to supply chain, healthcare, e-voting, identity management, asset tracking etc..., to name a few. While it's arduous or too early to predict the longer-term impact of Blockchain, it is safe to mention that it would have several vital impacts on various existing applications. For the usability purpose blockchain technology has evolved into two major platforms, public and private. A hybrid version of public and private blockchain is the consortium blockchain.

Public blockchain are also called the permissionless blockchain, where anyone can participate in the network or leave the network when required. Participants would be anonymous and open to all. In a private blockchain, participation is permissioned, usually used by industry and organization. Read, write operations need permission in a private blockchain network. This paper focuses on data

models used by the public blockchains and the data analytics tools used for efficient data analysis. The rest of the paper is arranged into four sections, section II gives an insight to the brief history of blockchain, section III on the data models used by public blockchains, section IV on the data analytics tools used and finally section V providing a conclusion to the topic of this paper.

II. HISTORY OF BLOCKCHAIN IN BRIEF

In 1983 the concept of e-cash protocols that can generate anonymous cryptographic electronic money was introduced by David Chaum and Stefan Brands. The idea of blockchain technology was described as early in 1991,by research scientists Stuart Haber and W. Scott Stornetta, as they introduced a computationally practical solution for time stamping digital documents, so that the documents could not be backdated or tampered with.The system used cryptographically secured chain of blocks to store the time-stamped documents. In 1992 the merkle tree concept were incorporated into the design, the concept was published on 1987, making it more efficient by allowing several documents to be composed into one block[2]. (however, the technology went unused and patent lapsed in 2004). In 2004, computer scientist and cryptographic activist Hal Finney, presented the system called RPoW(Re-usable Proof of Work). The system is operated by receiving a non exchangable or non-fungible hash cash based proof of work token and in return created an RSA-signed token, that can then be transferred from person to person. RPoW solved double spending problem by keeping the ownership of tokens registered on a trusted server that was designed to allow its users throughout the world to verify its correctness and integrity in real time. RpoW can be considered as an early prototype and a significant early step in the history of cryptocurrencies. In late 2008, a white paper introduced the concept of decentralized peer to peer electronic cash system called the Bitcoin, was posted to a cryptography mailing list by a person or a group named Satoshi Nakamoto.

III. BLOCKCHAIN DATA MODELS

The record keeping model in public blockchains can be often broadly categorized into two, unspent transaction output (UTXO) based (e.g., Bitcoin, Bitcoin Cash, Litecoin) and account/balance based (e.g., Ethereum) blockchains[3]. In both types of blockchains, a data block consists of a finite number of transactions. The goal achieved is to keep track of account balances, based on consensus mechanism, but the transactions differ in their characteristics in both models. The two-different types of blockchain transaction data models is briefly discussed below along with its pros and cons.

A. The Unspent Transaction Output Based Blockchain Data

The unspent transaction output (UTXO), as the name depicts is the unspent or leftover cryptocurrency available in the wallet. A wallet is basically a software application that provides an interface to store, access and manage, basically, cryptocurrencies as well as tokens (other assets) with the help of asymmetric keys (private and public keys). Wallets could be classified into five types like, online wallet (hosted and non-hosted),desktop wallet, mobile wallet, paper wallet, hardware wallet[4].These wallets can be used to manage cryptocoins or any UTXO based blockchains are the earliest and most valued blockchains: Bitcoin alone constitutes 45-60% of the total cryptocurrency [5] market capitalization. In UTXO blockchains each data block contains a set of (financial) transactions that encodes the transfer of coins among multiple parties. The basic structure of a transaction is shown in fig 3.1.

Version	Input counter	Inputs	Output Counter	Outputs	Lock Timestamp

Fig 3.1. Structure of a Transaction

The version field is the 4 byte version number of the protocol used by the application. Input counter is the no: of input UTXOs involved in that transaction. Inputs field gives the input UTXO's involved to make the required output UTXOs. Output field includes the output UTXO and output counter gives the no:of Output UTXO's. Lock Timestamp stores the time at which the transaction have been initiated. Each transaction has at least one input and one output. The fig 3.2 shows details of a part of the network transaction block that has 11 addresses(a1 to a11) and 6 Bitcoin transactions(t1 to t6)[]. Block boundaries are not displayed. Each transaction has at least one input and one output. Coins at addresses a7 and a8 remain unspent. The difference between input and output amounts (e.g., 0.2B at t1) are collected as the transaction fee. The equation for a New UTXO is as shown below,

New UTXO = (Sum of UTXOs in the transaction) − (Transaction amount) − (Transaction fee)

The above equation can be made understandable with an example. Let the sender be Alex, who has 100 bitcoins. Though the balance amount is shown as just one value ie 100 here, but how Alex got his balance is actually through several input UTXOs that accounted to his address.The input UTXO's can be four UTXOs worth 25 bitcoin each, two UTXOs worth 50, or a set of UTXOs valuing 34, 18, 43, and 5 bitcoin. The balance amount associated with a particular account is calculated by adding all the input UTXOs to that account. Alex sends 28 bitcoins to Alice, and say 2 bitcoins counts to transaction fees, thus Alex need to spent 30 bitcoins in order to perform that transaction. Thus new UTXO in this transaction is calculated as (100)-(28)-(2), and the value will be 70.The input UTXOs might also be the output UTXOs of some previous transaction. For example in Fig. 3.2, the transaction t4 have got two input UTXO's and three output UTXO's, but the two input UTXO's were the output UTXO's from addresses a2 and a3. There are three rules followed in order to shape data on UTXO blockchains. These rules are according to the design choices by Satoshi Nakamoto in Bitcoin [1]. The three rules are:

Source Rule: Input coins from multiple transactions can be merged and spent in a single transaction (e.g., the address a5 receives coins from t1 and t2 to spent in t4 in Fig. 3.2), or spent separately (e.g., in Figure 3.2, a9 spends coins received from t3 and t4 in t5 and t6) in different transactions.
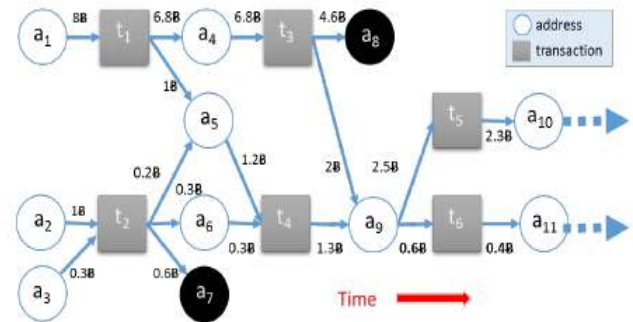
Fig. 3.2. A Portion of Bitcoin Transaction Network

Mapping Rule: Each crypto currency payment must show proof of their account funds by referencing a set of previous outputs. This allows anyone to trace back the history of payments, but it is not always possible to locate where a specific coin originated from. The reason is, each transaction lists a set of inputs and outputs, separately. For example, t2 has two inputs and three outputs, but an explicit mapping between inputs and outputs does not exist. Coins flowing to a9 might have come from either a4, a5 or a6, or from few of them. As a result, a transaction can be reflected as a lake with in-flowing rivers, and out-flowing rivers (i.e., emissaries).

Balance Rule: This rule states that, coins received from one transaction must all be spent in a single transaction. Any amount that is not sent to an output address is considered to be the transaction fee, and rewarded to the miner who validates and creates the block. The difference between input and output amounts (e.g., 0.2B at t2) are collected as the transaction fee. In order to keep the change, or the returned UTXO's, the coin spender can create a new address (i.e., change address) and send the remaining balance to this new address. Another option is to use the spender's address as one of the output addresses, and re-direct the balance. The reuse of the spender's address is discouraged. Thus, most nodes appear in

the graph only two times; once when it receive coins and once when it spends. The change address, if created, becomes the new address of the coin owner. Due to these rules, the unspent transaction output based blockchains should be considered as forward branching trees, rather than networks.

Fig. 3.3. The UTXO or Unspent Transaction Output Model

The UTXO model has potential benefits such as, it simplifies the accounting methods of blockchain, it is easy to keep track of coins, it does not allow double spending or stop from spending non existing coins. This model makes parallel processing easy, thus improves scalability. UTXO model is stateless, it doesn't store the states, thus makes it easy for users to use new addresses for every transaction, this improves privacy to a certain extent. Bitcoin also supports multiple scripting types which allow it to process complex payment logics. it allows for Simple Payment Verifications (SPV) on the network, which allows the wallets to interact with the blockchain environment in a decentralized and trustless manner without having to download the entire Bitcoin blockchain, thus significantly reducing storage.

Disadvantages of UTXO model are revealed when it is applied to a more complex turing complete platforms such as ethereum. This model is weak in programmability and complex computations. As the input UTXOs increases, it becomes difficult to verify the growing scripts and store the witness data. The Bitcoin transaction started with 50 bitcoins, and halves the block reward every 4 years. This geometric series will result in a total of 21 million bitcoins. The global state at any given time is the set of all spendable UTXOs. Most crypto-currencies have the same data model as Bitcoin.

B.   Account Based Blockchain Data

Account based blockchain used in ethereum is similar to how accounts are maintained in banks, an address can spend a portion of its coins and keep the remaining balance. Thus a transaction has exactly one input and one output address. Even though address creation is free, mostly a single address is used to receive and send coins several times. Ethereum blockchain was released in 2015 by Vitalik Buterin[6]. The main idea behind ethereum environment is to build and run smart codes(known as smart contracts) on blockchain network. The account based blockchains use two types of addresses; one is externally owned addresses (governed by users) and the other, contract addresses (governed by smart contract code). A transaction to upload the Smart Contract code to a contract address is typically initiated by an externally owned address (i.e., user address), but it can also be initiated by a contract address. The code at the address is stored in the Blockchain and replicated at all Blockchain nodes. In other words, uploading the contract forces other nodes to store the code locally. Account based blockchains have two types of transactions. One is the transactions that happens using cryprocurrency, such as Ether on Ethereum, between two addresses. This can be modeled with a directed edge between the two addresses. The second type, internal transactions, are created when smart contracts change states associated with addresses. Asuume a sell order issued by address a1 to a Smart Contract where the to parameter is a2 and the value parameter is 3 tokens. The Smart Contract creates an internal transaction that transfers 3 tokens from a1 to a2. Internal transactions can be discovered in two different ways: by parsing the transaction's message and updating states associated with a1 and a2 manually, or by running the transaction message through the smart contract code and observing the states and logs created during execution. Another option is to run a full Ethereum node and execute every contract transaction. This is costly in terms of time and resources. The parsing option is easier as it does not require code execution.   However, the

parsing method cannot discover transaction failures (due to reasons such as insufficient gas), and create internal transactions that do not actually exist.
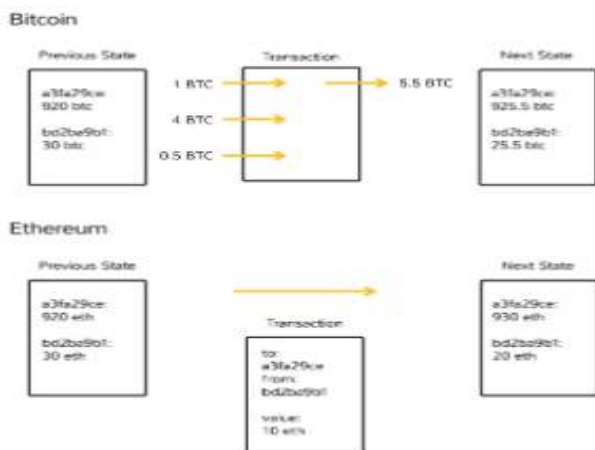
Fig. 3.4. UTXO VS Account Model

Benefits of account based model are simplicity in the development of complex smart contracts that involves multiple parties and state information. This model allows to save space, as it only needs to make one reference and signature that produces one output, contrary to UTXO design. Possible disadvantages are the scalability issues and need for additional evaluation to check for correctness of transactions.

IV. DATA ANALYTICS TOOLS

Blockchain data analysis is gaining interest in the market now, both for business applications and in research area. In this section, prominent data analytics tools are discussed in brief. The most widely used tool in Blockchain data analysis is Blocksci, which is an open source platform, that allows fast and sensitive analysis of data stored [7]. BlockSci's core infrastructure is written in C++ and optimized for speed. It works well with python as well as Jupyter interface. Another tool used is Biva, for network visualization and data analysis. This area is still undergoing updations and rapid developments.

V. CONCLUSION

The blockchain technology has got wide acceptance in the society as it can have major contributions to many applications that can have direct impact. Research works are happening at an intensive level

to keep up the expectations from the market. Even many MNC's have invested in this technology foreseeing its impact. The latest contributor is the Google with its BigQuery database, which is a highly scalable enterprise data warehouse used for productive data analysis. This paper mainly focused on the data models used with Bitcoin and ethereum network, its advantages and disadvantages.

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Review on Feature Selection for the Analysis of Human Activities and Postural Transitions on Smart Phone.

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ABSTRACT

Most of the data in real world used for prediction have many features which are relevant and irrelevant. While performing prediction with large number of features, it will depreciate the performance in the terms of accuracy, space and time. To address this, features which influence the target prediction has to considered. Features which are irrelevant and redundant has to be eliminated. For the purpose, there are many algorithms. For high dimensional data like smartphone based recognition of human activities and postural transitions, requires feature selection. Many feature selection methods are applied and compared to get the best performance in terms of accuracy. It is found that Recursive feature elimination outperform others.

Keywords : Recursive feature elimination, feature selection, irrelevant, redundant, prediction, accuracy.

I. INTRODUCTION

Feature selection is called Variable selection or Attribute selection. It is referred as automatic selection of the attributes in data that are most relevant to the predictive output. Feature selection is the process of obtaining subset from the original feature set as per certain feature selection criterion, which selects all the relevant features. It also plays role in compressing the data processing scale, where all the redundant and irrelevant features are removed from data that do not contribute to the accuracy of predictive model or which may decrease the accuracy of the model. Redundant features are the features which add no relevant information to your other features, because they are correlated or because they can be obtained by combination of other features. Having such features may not affect information wise but affects the training and classification some times. Feature selection methods

help in mission to create an accurate predictive model. They also help in selection of features that give better accuracy. Good FS results reduces learning time, improve learning accuracy, and simplify learning results[1]. Three main objectives of feature selection are: (1) Feature selection reduces the overfitting i.e., less redundancy of data, (2) Feature selection also improves the accuracy i.e., less misleading data, (3) Feature selection reduces the training time i.e., if data is less then algorithms train faster. There are many different types of methods of feature selection like Boruta, Feature Importance, Genetic Algorithm(GA), Information Value And Weight Of Evidence(IV and WOE), Lasso regression, recursive feature elimination(RFE), principal component analysis(PCA), Simulates Annealing(SA), Stepwise Forward And Backward Selection, Univariate Selection.

In this paper , Section 1 is a literature survey on the methods of feature selection and classifiers.

Section 2 describes in detail about the cause to choose feature subset selection over feature extraction, it also explains about the RFE algorithm and logistic regression classification method. Section 3 is all about the results where accuracies of experiments of each FS method is compared and the one which is efficient among the methods are considered.

II. LITERATURE SURVEY

In this section, it is mainly discussed on three methods that is feature subset selection, feature extraction and classification.

A. Feature-Subset-Selection

Feature subset selection(FSS) is a technique used to select variables from huge data which improve the accuracy of the model. In addition, the best FSS method can also reduce the cost of feature measurement. FSS plays major role in data mining and machine learning fields. A good Feature subset selection algorithm can efficiently and effectively remove all the irrelevant and redundant features and take in consideration of only those features which are important in the prediction of the target.

In feature subset selection there are different techniques ,(1)Boruta-Boruta is the technique which achieves supreme importance when a data set comprised of several variables is given for model building. Particularly when one is interested in understanding the mechanisms related to the variable of interest, this technique is used. . Boruta is a simple algorithm used for feature selection, it find all features which are either strongly or weakly relevant to the decision variable and it is an easy to use package as there aren't many parameters to remember. These make the advantages of Boruta. The main disadvantages of Boruta are data set with missing values should not be used to check important variables using Boruta, if so it will throw errors and Boruta can be used only on classification/regression. Boruta is well suited for biomedical applications where one might be interested to determine which human genes(features or attributes)are connected in

some way to a particular medical condition(target variable or predicted output)[2]. (2)Feature Importance-In feature importance model we importance of feature is measured by calculating rise in the model's prediction error after permuting the particular feature. A feature is "unimportant" if shuffling its values leaves the model error unchanged, because in this case the model ignored the feature for the prediction. Feature importance gives highly compressed and global insight into the model's behavior. A positive aspect of using the error ratio instead of the error difference is that the feature importance measurements are comparable across different problems. The importance measure automatically takes into account all interactions with other features. Permutation feature importance does not require retraining the model. The disadvantages of feature importance are it is very unclear whether you should use training or test data to compute the feature importance, permutation feature importance is linked to the error of the model. You need access to the true outcome. If someone only provides you with the model and unlabeled data but not the true outcome you cannot compute the permutation feature importance. The permutation feature importance depends on shuffling the feature, which adds randomness to the measurement. When the permutation is repeated, the results might vary greatly. Repeating the permutation and averaging the importance measures over repetitions stabilizes the measure, but increases the time of computation. If features are correlated, the permutation feature importance can be biased by unrealistic data instances. Another tricky thing is adding a correlated feature can decrease the importance of the associated feature by splitting the importance between both features. Feature importance is used in fitting a support vector machine model to predict the number of rented bikes, given weather conditions and calendar information and random forest model is fitted to predict cervical cancer[3].(3) Genetic Algorithm(GA)- The main idea of genetic algorithm is to combine the different solutions generation after generation to extract the best genes (features) from

each one. That way it creates new and more fit individuals. This algorithm work on population of the individuals in order to produce better approximations. At every generation new population is produced/created by selecting individuals as per to their level of fitness. And these are recombined together using operators from natural genetics and the offspring may also undergo mutation. This algorithm leads to the evolution of population that suits their environment in better way than those individuals that they were created from just as in nature adaptation. Here for the prediction of model accuracy fitness values are used. The advantage of this technique over others is that it allows the best solution to emerge from the best of the prior solutions. An evolutionary algorithm which improves the selection over time. One issue with using GAs for feature selection is that the optimization process can be very aggressive and there is potential for the GA to overfit to the predictors. GA is applied in Hyper-tuning parameters, finding the maximum (or minimum) of a function, or searching for the correct neural network architecture (neuro evolution)[4]. (4)Information Value And Weight Of Evidence-Weight of evidence (WOE) and Information value (IV) are simple, yet powerful techniques to perform variable transformation and selection. These concepts have huge connection with the logistic regression modelling technique. The weight of evidence tells the predictive power of an independent variable in relation to the dependent variable. Since it evolved from credit scoring world, it is generally described as a measure of the separation of good and bad customers. "Bad Customers" refers to the customers who defaulted on a loan. and "Good Customers" refers to the customers who paid back loan. This algorithm Handles missing values and handles outliers. The transformation is based on logarithmic value of distributions. This is aligned with the logistic regression output function. Here there is no need for dummy variables. By using proper binning technique, it can establish monotonic relationship (either increase or decrease) between the independent and dependent variable. Also, IV

value can be used to select variables quickly. IV and WOE have demerits like loss of information (variation) due to binning to few categories. It is a "univariate" measure so it does not take into account correlation between independent variables. It is actually easy to overfit or manipulate effect of the variables according to how categories are created. IV and WOE is widely used in credit scoring to measure the separation of good versus bad customers[5]. (5) Lasso Regression-LASSO refers to least absolute shrinkage and selection operator regression is a type of regularization method. It basically imposes a cost to having large weights (value of coefficients). And it is called L1 regularization, because the cost added, is proportional to the absolute value of weight coefficients. As a result, in the process of shrinking the coefficients, it eventually reduces the coefficients of certain unwanted features all the to zero. That is, it removes the unneeded variables altogether. So effectively, Lasso regression can be considered as a variable selection technique as well. LASSO is that it is better than the usual methods of automatic variable selection such as forward, backward and stepwise - all of which can be shown to give wrong results. The results from LASSO are much better. The biggest disadvantage of LASSO is that it is automatic; therefore, it has problems. The biggest problem is that it lets you (the data analyst) avoid thinking. Other, lesser problems. It can also produce models that make no sense. It ignores nonsignificant variables that may, nevertheless, be interesting or important. It doesn't follow the hierarchy principle. Lasso regression are powerful techniques generally used for creating parsimonious models in presence of a 'large' number of features[6]. (6)Principal component analysis- It is a basic technique well-suited for this problem which is called as PCA which tries to find the directions of most variation in your data set. PCA gives us the transformed feature set. Assume that the dimensionality of the feature set is larger than just two or three. Using PCA we can identify what are the most important dimensions and just keep a few of them to explain most of the variance we see in our data. Hence we can drastically

reduce the dimensionality of the data and make EDA(exploratory data analysis) feasible again. Moreover, it will also enable us to identify what the most important variables in the original feature space are, that contribute most to the most important PCs. Intuitively, one can imagine, that a dimension that has not much variability cannot explain much of the happenings and thus is not as important as more variable dimensions. PCA removes correlated features where after implementing the PCA on your dataset, all the Principal Components are independent of one another. There is no correlation among them. With so many features, the performance of your algorithm will drastically degrade. PCA is a very common way to speed up your Machine Learning algorithm by getting rid of correlated variables which don't contribute in any decision making. The training time of the algorithms reduces significantly with less number of features.

Overfitting mainly occurs when there are too many variables in the dataset. So, PCA helps in overcoming the overfitting issue by reducing the number of features.

PCA transforms a high dimensional data to low dimensional data so that it can be visualized easily. The disadvantage of PCA are after implementing PCA on the dataset original features will turn into Principal Components. Principal components are not readable as original features. Data must be standardized before principal component analysis. If we don't select the number of components properly it may miss some information. Data compression, Image processing, visualization, exploratory data analysis, pattern recognition and time series prediction is done using PCA. PCA can be viewed as a special scoring method under the SVD algorithm. [7]. (7) Simulated Annealing- Simulated annealing is a global search method that makes small random changes (i.e. perturbations) to an initial candidate solution. If the performance value for the perturbed value is better than the previous solution, the new solution is accepted. From this, a sub-optimal solution can be accepted on the off-change that it may eventually produce a better solution in

subsequent iterations. Simulated annealing is known for the better behavior than the naive local search algorithm because it enables us to leave the local optima to find the best answers. A disadvantage is that the SA algorithms are computation intensive. There exist faster variants of the Simulated annealing, but these are not as quite easily coded and widely used[8]. (8) Step forward and Step backward feature selection- In step forward feature selection starts each individual feature is evaluated, and selects the one which results in the best performance. Further, the second feature is selected by all possible combinations of that selected feature and by evaluating the subsequent feature, and so on, until the required predefined number of features is selected. Step backward feature selection is closely related, and as you may have guessed starts with the entire set of features and works backward from there, removing features to find the best subset. The primary advantage of stepwise regression is that it's computationally efficient. It's faster than other automatic model-selection methods. It provides vital information about the quality of predictors by observing the order in which variables are added or removed. Both the methods are potentially very computationally expensive. These methods may take too long to be at all useful, or may be totally infeasible. That said, with a dataset of accommodating size and dimensionality, such an approach may well be your best possible approach. Have to keep in mind that an optimized set of selected features using a given algorithm may or may not perform equally well with a different algorithm. Collinearity is usually a major issue. Excessive collinearity may cause the program to dump predictor variables into the model. Some variables (especially irrelevant variables) may be removed from the model, when they are deemed important to be included. These can be manually added back in[9]. (9) Univariate Selection- Statistical tests can be used to select those features that have the strongest relationship with the output. CHI SQUARED test is one such statistical test which is used to select the best features. This algorithm examines each and

every feature separately to determine the strength of relationship of feature as per the response variable. Univariate feature selection is in general best to get a better understanding of the data, its structure and characteristics. This method gives better understanding of the data. There are lot of different options for univariate selection. Univariate filter methods are ideal for removing constant and quasi-constant features from the data. The disadvantages of univariate selection are it can work for selecting top features for model improvement in some settings, but since it is unable to remove redundancy (for example selecting only the best feature among a subset of strongly correlated features), hence this task is better left for other methods. One of the major disadvantage of univariate filter methods is that they may select redundant features because the relationship between individual features is not taken into account while making decisions. Univariate selection is mainly used in image processing. It has industrial applications and text mining[10]. (10) Recursive Feature Elimination- The Recursive feature elimination is a method which recursively removes the attributes. And build a model on the attributes that remain and makes use of the accuracy of the model in order to find which attributes contribute the most in predicting target. It can be an effective and relatively efficient technique for reducing the model complexity be removing irrelevant predictors. The principal drawback of RFE is the huge time consumption. It is used in Microarray datasets like colon cancer, lymphoma3 cancer, and Cancer of Unknown Primary (CUP). RFE is also applied mainly in gene-related studies, specially gene recognition and disease diagnosis. The above are the methods or techniques of feature subset selection where some of them outperform others and some may not[11].

B. Feature extraction

Feature extraction is defined as process of reduction in the data dimension where starting set of raw data is reduced to more manageable groups or sets. A characteristic of these large data sets is a large number of variables which need lot of resources for computing. Feature extraction is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be processed, while still accurately and completely describing the original data set.

When there is need to reduce the number of resources needed for processing without the loss of precious data then the process of feature extraction is very advantageous. Feature extraction can also reduce the amount of redundant data for a given analysis. Also, the reduction of the data and the machine's efforts in building variable combinations (features) facilitate the speed of learning and generalization steps in the machine learning process.

Practical uses of Feature Extraction are Autoencoders: The purpose of autoencoders is unsupervised learning of efficient data coding. Feature extraction is used here to identify key features in the data for coding by learning from the coding of the original data set to derive new ones. Bag-of-Words: A technique for natural language processing that extracts the words (features) used in a sentence, document, website, etc. and classifies them by frequency of use. This technique can also be applied to image processing. Image Processing: Algorithms are used to detect features such as shaped, edges, or motion in a digital image or video. There are many varieties of methods for managing texture are developed The other methods which also come under feature extraction are independent component analysis, isomap, kernel principal component analysis, latent semantic analysis, partial least squares, principal component analysis, multifactor dimensionality reduction, non-linear dimensionality reduction, multilinear principal component analysis, multilinear subspace learning, semidefinite embedding, autoencoder[12].

C. Classification

Classification algorithms can be applied on unstructured or structured data. Classification is a technique where data is categorized into number of

classes. Identifying the class to which a new data will fall under is the main aim of classification problem.

There are different types of classification methods. (1) Logistic regression : Logistic Regression is a machine learning classification algorithm i.e., CLASSIFIER. Produces results in a binary format .So the outcomes are discrete/categorical such as: 0 or 1, yes or no ,true or false, high and low. Logistic regression is designed for this purpose (classification), and is most useful for understanding the influence of several independent variables on a single outcome variable. Works only when the predicted variable is binary, assumes all predictors are independent of each other, and assumes data is free of missing values. (2) Naïve Bayes: Naive Bayes algorithm is based on Bayes' theorem. With the assumption of independence between every pair of features Naive Bayes classifiers work well in many real-world situations i.e., spam filtering and document classification. These are fast compared to more sophisticated methods. It requires small amount of training data to estimate the necessary attributes. The main disadvantage of Naive Bayes is it is known to be a bad estimator. (3) Stochastic gradient descent: It is a simple and very efficient method to fit linear models. When the number of samples is very large it is specifically very useful. It supports different loss functions and penalties for classification. The advantages of this algorithm are efficiency and ease of implementation. The disadvantages are it requires a number of hyper-parameters and it is sensitive to feature scaling.(4) K-Nearest Neighbours: Neighbours is a lazy learning. It is so called because it simply stores instances of the training data. And does not attempt to construct a general internal model. From a simple majority vote of the k nearest neighbours of each point classification is computed. This algorithm is simple to implement, robust to noisy training data, and effective if training data is large. The disadvantages are need to determine the value of K. Since it needs to compute distance of each instance to all the training samples cost of computation is high .(5)Decision Tree: Decision tree is simple to understand. It is also easy to visualize. Decision tree

requires little data . The disadvantage of this algorithm is tree can create complexity. Created tree can be unstable because of small variations in the data. This can lead to the creation of completely different tree sometimes.(6)Random forest: Random forest classifier is named as meta-estimator. It is so called because it fits a number of decision trees on different sub samples of datasets. It uses average to improve the accuracy prediction of model. And hence controls over fitting. The size of sub sample is same as the size of original input always. But the samples are drawn with replacement. In terms of over fitting Random forests outperform decision trees in most of the cases. This classifier has slow real time prediction. It is difficult to implement and complexity of algorithm is high.(7) Support vector machine: SVM is a represents the training data as points in space separated into categories by a clear gap that is as wide as possible. Further new examples are mapped into that same space and then predicted to belong to a category based on side of the gap they fall. This classifier is better in high dimensional spaces. And then it uses a subset of training points in the decision function so that it is also memory efficient. The algorithm does not directly provide probability estimates, these are calculated using an expensive five-fold cross-validation[13].

III. METHODOLOGY

Feature subset selection indeed reduces the dimension whereas feature extraction adds on the dimension. Anyhow in this paper our motive is to classify and as well as select the prominent features which truly plays vital role in predicting the target. It improves the performance of learner's interpretability. Hence we choose to implement feature subset selection algorithm.

Although a large number of FSS algorithms have been proposed, there is no single algorithm which performs uniformly well on all feature selection problems. Many experiments have confirmed that there could exist significant differences of performance (e.g., accuracy) among different FSS

algorithms for a given data set. That means for a given data set, some FSS algorithms outperform others. This raises a practical and very important question that which FSS algorithms should be picked up for a given data set? The common solution is to apply all candidate FSS algorithms to the given data set, and choose one with the best performance by the cross validation strategy. However, this solution is quite time-consuming especially for high dimensional data. For the purpose of solving this problem in a better way, in this paper, an FSS algorithm automatic recommendation method is proposed. Based on the study and comparing different feature selection algorithms we could find that RECURSIVE FEATURE ELIMINATION ALGORITHM(RFE) would help us to select the prominent features for predicting the target efficiently. So, in this paper let us learn about the Recursive Feature Elimination in a detailed manner.

A. RECURSIVE FEATURE ELIMINATION

Recursive feature elimination is a backward compatible way of feature selection. It makes use of the accuracy to find which attributes contribute lot for predicting the target attribute. Recursive feature elimination works by recursively removing predictors/attributes and then building a model on those predictors/attributes that remain. In this technique initially model is built based on the entire set of features(predictors/attributes) and compute score for each predictor. The least important predictors(features or attributes) are then removed, the model is re-built, and importance scores are computed again. In practice, the analyst specifies the number of predictor subsets to evaluate as well as each subset's size. Therefore, the subset size is a tuning parameter for RFE. [11].

Steps that tells how RFE works are as follows are initially start with all the features and then build a model. Then calculate the accuracy score for the model and check the accuracy score. In the next step, remove or eliminate one feature and build the model again. Now see how much of variation is caused in accuracy score. And then based on this decide

whether to keep the feature or remove the feature. If the accuracy score has increased because of eliminating the feature then eliminate the particular feature. If the accuracy score has decreased because of eliminating the feature then retain the feature in the model.

Hence RFE can be an effective and relatively efficient technique for reducing the model complexity be removing irrelevant predictors.
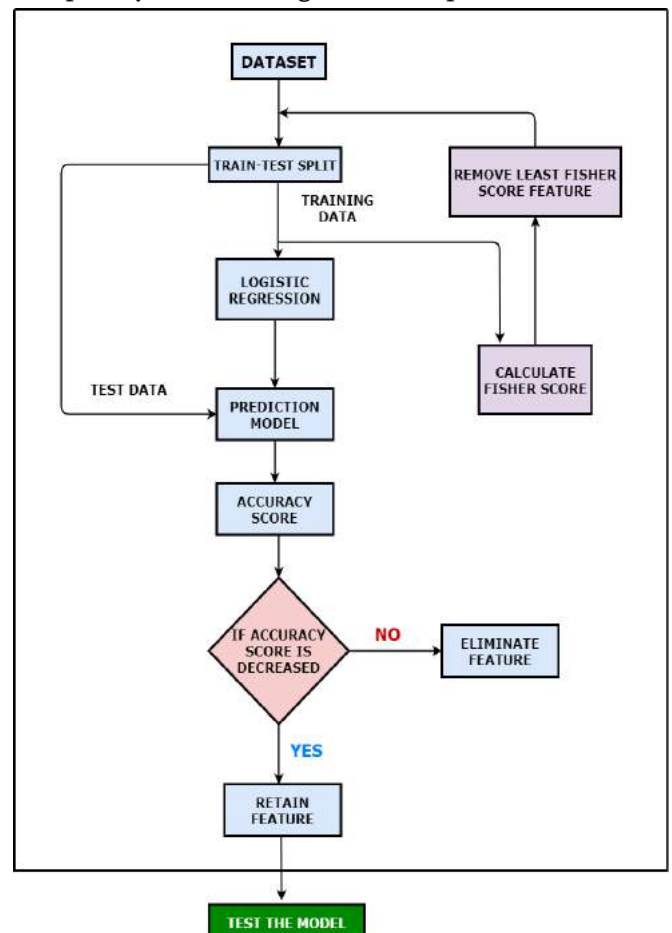
Figure.1 Recursive Feature Elimination

B. LOGISTIC REGRESSION

Logistic Regression is a machine learning classification algorithm i.e., CLASSIFIER. Produces results in a binary format .So the outcomes are discrete/categorical such as: 0 or 1, yes or no ,true or false, high and low. The assumptions of logistic regression are binary logistic regression requires the dependent variable to be binary. For a binary regression, the factor level 1 of the dependent variable should represent the desired outcome. Only the meaningful variables should be included. The independent variables should be independent of each

other. That is, the model should have little or no multicollinearity. The independent variables are linearly related to the log odds[1].

Figure 2 Logistic Regression

IV. RESULTS

In this paper, four different methods of feature selection are applied on Smartphone-Based Recognition of Human Activities and Postural Transitions data set and compared the accuracy of one with another. For each method ten experiments are performed and their Mean Accuracy(MA) is calculated and as well as Variance(V) and Variance Score(VS) are also calculated. Mean accuracy is the mean of accuracies of the ten experiments performed.

VarianceScore(VS)=Mean Accuracy(MA)/Variance(V)

In the dataset "smartphone-based recognition of human activities and postural transitions" :

No of predictors/attributes-7767
No of records-561

Table 1 Accuracy of FS Methods

METHODS	Number of Features before FS	Number of Features after FS	Number of Experiments	Mean Accuracy(%)	Variance	Variance Score
UNIVARIATE SELECTION	7767	7667	10	64	5.8	11.03
PRINCIPAL COMPONENT ANALYSIS	7767	4	10	86	3.3	26.06
RECURSIVE FEATURE ELIMINATION	7767	7444	10	94	2.2	47.72
FEATURE IMPORTANCE	7767	7588	10	75	4.4	17.04

Here the method which has high mean accuracy and less variance gives high variance score. Hence the method which satisfies this criteria outperform other methods.

In this paper, four methods of FS were compared and ten experiments for each method were performed and their mean accuracy is considered. Among the four, recursive feature elimination gives the maximum mean accuracy and minimum variance where its variance score has outperformed other methods. Since RFE gives the best and high variance score it can be said that Recursive Feature Elimination is a better method for the removal of irrelevant features and prediction of the target attribute rather than the other methods.
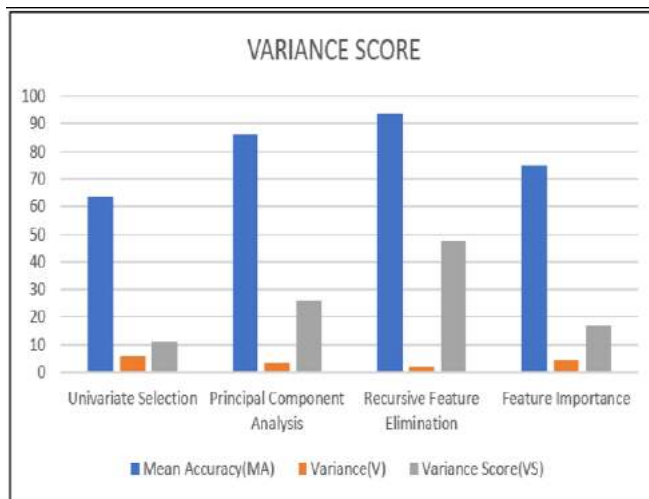
Figure 3 Variance Score

In the above graph, RFE has got the high mean accuracy and variance score compared to others which tells that RFE has the better performance.

V. CONCLUSION

Recognition of Human Activities and Postural Transitions can be done using Smartphone, but the data collected from the smartphone may or may not influence the Human Activities or Postural Transitions. To understand the features which influence Human Activities and Postural Transitions, it is important to identify the features which influence the classification process. For the purpose, two activities are performed viz., identifying relevant features and eliminating redundant features using

RFE algorithm. Ten experiments were conducted in each of the algorithm considered and it is found that the mean accuracy of RFE is better than others state of art methods. RFE is more reliable because the accuracy score across the experiments were consistent and is evident from the variance graph. Variance score is a performance measure which illustrates the best algorithm and RFE is proved to be better than others. The problem with RFE is it consumes more time since it iterates. To overcome this limitation, linear support vector machines can be combined with recursive feature elimination strategy.

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Recognition of Labels for Hand Drawn Images

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ABSTRACT

Freehand sketch drawings are highly abstract and sparse in structures. Due to the diversity, highly iconic and intra-class deformations of these sketches, automatic recognition is more a challenging task. This paper, sheds light on developing an efficient recognition scheme of freehand sketch, based on Convolutional Neural Networks (CNNs). Furthermore, this paper seek to classify Google's 'Quick, Draw!' dataset sketches which contains more than 50 million drawings across 345 categories by creating a Keras model. It aim to integrate a custom model to an Android app using Tensor flow Lite. Such a system will outperform for variety of applications, such as human-computer interaction, sketch-based search, game design, and education.

Keywords : Component, Formatting, Style, Styling, Insert (Key Words)

I. INTRODUCTION

Google's experimental game Quick, Draw! Doodle was framed to educate public about artificial intelligence. In this game, user are asked to immediately draw an image of depicted category and at the other end neural network attempts to effectively recognize the image that is either incomplete or doesn't match with any existing labels. Other significant areas whereby doodle can span includes computer vision and pattern recognition, sketch-based search, game design, and education, which works on highly noisy datasets etc. This project focuses on classification of doodles which is in as such a tedious task because of numerous categories, variations and same resemblance at large and whose output is the predicted category for the depicted object.

II. RELATED WORK

Variant outlook to achieve efficiently better results has been made by computer vision in different applications. Eitz et al. [1] successfully demonstrated achievement of classification rates for computational sketch recognition by using feature vectors, bag of words sketch representation and SVMs to classify sketches. Schneider et al. [4] then modified the benchmark by making it more focused on how the image should like, rather than the original drawing intention, and they also used SIFT, GMM based on Fisher vector encoding, and SVMs to achieve sketch recognition.

In general, the majority of the earlier systems used to pull out sketch features which is thereby fed to a classifier. Convolutional neural CNN) have emerged as a vigorous framework for feature representation and recognition [3]. These type of neurons

biologically inspired feed-forward artificial neural network composed of multiple layers of neurons, and the neurons in each layer are then collected into sets. At the input layer, where the data gets introduce to the CNN, these neuron sets map to small regions of input image. Deeper layers of the network can be composed of local or global pooling (fully-connected) layers which combine outputs of the neuron sets from previous layer. Pooling is achieved through convolution-like operations. Deep neural networks (DNN), especially CNNs, are trained to automatically learn features instead of manually extracting features and likewise its multi layers learning can get more effective expression. When it comes to CNN design, the inclination in the past few years has pointed in one direction: deeper networks [3]. This move towards deeper networks has been beneficial for many applications. Amongst most outstanding application has been object classification, where the deeper the neural network, the better the performance. However, existing CNNs are designed for photos, and they are trained on a massive amount of data to avoid overfitting. Traditional CNNs are limited in depth, as empirical results showed that training error increased with depth, suggesting that deeper networks become increasingly hard to train. This problem was addressed by He et al. with the introduction a deep residual network architecture, which uses shortcut connections to allow convolutional layers to approximate residuals rather than actual mappings [2]. Their model was able to set new records for both the ImageNet and COCO datasets, and through the application of residual networks, CNNs with over a thousand layers have been trained.

III. METHODOLOGY

A. Convolutional Neural Network

An input image after processing is classified by CNN under certain categories. For CPU, an input image is an array of pixels and it depends on the image resolution.Thereafter, each input image will pass through a series of convolution filter layers(kernels),

followed with feature extraction, also known as pooling all connected layers and implement softmax function to classify an object with probabilistic values between 0 and 1.

Fig 3.1 Neural network with many convolutional layers

Stride is the number of pixel shifts over the input matrix. If the stride is 1 then move the filters to 1 pixel at a time. If the stride is 2 then move the filters to 2 pixels at a time and so on. Occasionally when filter does not perfectly fit the input image, it allows to have two options:

- Pad the picture with zeros (zero-padding) so that it fits.
- Drop the part of the image where the filter did not fit and keep only valid part of the image called as valid padding.

Rectified Linear Unit for a non-linear operation is used to introduce non-linearity in our ConvNet. The output is

$f(x) = \max(0,x)$.

For larger images, pooling layers section would reduce the number of parameters. Max pooling and average take the largest element from the rectified feature map.

B. Proposed System Architecture

For a $28 \times 28 \times 1$ doodle, first run the image through two convolutional filters. Zero padding border around the image were added so that resultant outcome have same width and height. The output then goes through a max pooling layer with a kernel size of 2×2. Subsequently, it will flatten the tensor and feed the result through two fully-connected or dense layers. Every layer utilizes the ReLu activation function as well as dropout. The outcome is then passed through one more affine transformation before applying softmax to generate probabilities for each class.

IV. SIMULATION AND RESULTS

Quick, Draw! dataset containing over 50 million images across 345 categories was openly released by Google with multiple different representations for the images. One dataset represents each drawing as a series of line vectors, and another contains each image in a 28x28 grayscale matrix. Since focus is on classification of the entire doodle, the latter version of the dataset is used. We treat each 28x28 pixel image as a 784 dimensional vector
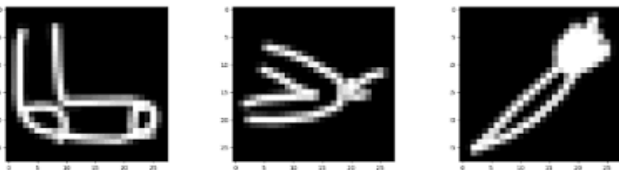
Fig 4.1 Sample doodles of a sock, elbow, and carrot (left to right) from the training dataset

For testing our models, the data got split into two different folds: 80% for training and 20% for testing10% randomly sampling of the drawings categorically were created to reduce computation time and storage of the data. As a result, obtained approximately 4,000 examples for the training set and 1,000 examples for the testing set Evaluation Parameters

Although accuracy penalizes harshly for an incorrect prediction (wrong predictions receive 0 points and right predictions receive 1 point), it is a good measure to detect performance. As it has so many categories, including some that are highly analogous, it evaluates methods not only with accuracy but also with a scoring metric that is more tolerant of errorneous predictions. Top_k_categorical_accucary metric provided by keras calculates the top-k categorical accuracy rate

A. Performance Evaluation

Best performance for the CNN was accomplished by tuning various hyper parameters including the number of units in each dense layer, dropout rate, and learning rate. Mostly, found that the model yielding the best prediction had two dense layers with 512 and 256 units with each layer having a

dropout rate of 0.2. Furthermore, it has trained model with batch size of 256 across 10 epochs.
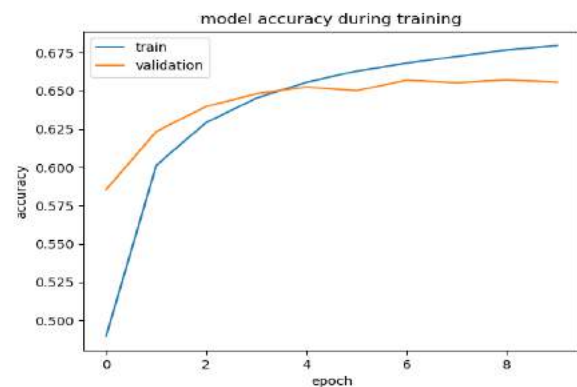
Fig 4.2 Training Accuracy

As seen from figure 4.2, the end architecture fits the data well as the validation accuracy has more or less converged after the 6th epoch. Furthermore, following were the accuracies achieved on the testing dataset:

1.	Final accuracy: 65.57%
2.	top-3 accuracy: 82.71%

Fig 4.3 Sample of Input/Output

We would like to experiment with advanced CNN architectures such as VGG-Net and ResNet, which have already reached state-of-the-art levels of image classification performance, although not for sketches in particular. Additionally, we have only used approximately 10% of the total Quick, Draw! dataset, and we believe training our models on the complete dataset would improve accuracy.

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Productive Scheduling of Scientific Workflows utilizing Multiple Site Awareness Big Data Management in Cloud

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ABSTRACT

The general relationship of cloud server farms is empowering expansive scale rational work methodology to brace execution and pass on fast reactions. This outstanding geographical task of the calculation is extended by accomplice improvement inside the size of the data managed by such applications, development of title new issues known with the ground-breaking information association transversely over objectives. High aggregate, low potential outcomes or cost related exchange offs an area unit solely two or three burdens planned for along cloud suppliers and purchasers regarding managing data crosswise over server farms. Existing approaches are impacted to cloud-gave limit, that offers low execution in lightweight of fixed costs plans. Hence, work methodology engines need to take care of business substitutes, accomplishing execution at the expense of opposing framework courses of action, keep costs, diminished solid quality and reusability. We tend to gift Overflow, accomplice never-ending data association framework for genuine work techniques running transversely over topographically spread objectives, needing to get cash related prizes from these geo-differentiating qualities. Our answer is condition careful, in light of the way that it screens and depictions the general cloud framework, responsibility unprecedented and expected information managing execution for exchange worth and whole, inside and transversely over goals.

Keywords : Big Data Management, Cloud Server, Google Cloud, Bio-Informatics, VM

I. INTRODUCTION

The proposed paper tells how efficiently we can manage cloud workflows in a site which has data in huge chunks. All of this data is stored in such a way after cleansing the data and filtering the old data with all the algorithms involved to further next processes.

The communication of Overflow framework with the work process the executives frameworks is done dependent on its open API. For instance, we have incorporated our answer with the Micro-delicate Generic Worker [2] by supplanting its default Azure Blobs information the board upheld with Overflow. We did this by basically mapping the I/O calls of the work process to our API, with Overflow utilizing the information access design mindfulness as fuehrer nitty.

The top (server) layer uncovered a lot of functionalities as administrations (see Section 4). The administrations influence data, for example, information arrangement, execution estimation for explicit tasks or cost of information the board, which are made accessible by the center layer. This data is

conveyed to clients/applications, so as to design and to improve expenses and execution while picking up mindfulness on the cloud condition.

10 years back an IT anticipate or fire up that required solid and Internet associated figuring assets needed to lease or place physical equipment in one or a few server farms. Today, anybody can lease processing time and capacity of any size. The range begins with virtual machines scarcely amazing enough to serve pages to what could be compared to a little supercomputer. Cloud administrations are for the most part pay-as-you-go, which means for a couple of hundred dollars anybody can appreciate a couple of long periods of supercomputer control. Simultaneously cloud administrations and assets are internationally dispersed. This arrangement guarantees a high accessibility and solidness unattainable by most however the biggest associations.

The distributed computing space has been overwhelmed by Amazon Web Services up to this point. Progressively genuine options are developing like Google Cloud Platform, Microsoft Azure, Rackspace, or Qubole to give some examples. Significantly for clients a battle on stage measures is in progress. The two front-running arrangements are Amazon Web Services perfect arrangements, for example Amazon's own offering or organizations with application programming interface good contributions, and OpenStack, an open source venture with a wide industry backing. Thus, the decision of a cloud stage standard has suggestions on which apparatuses are accessible and which elective suppliers with the equivalent enormous information handling technologies are accessible.

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in progress. The two front-running arrangements are Amazon Web Services perfect arrangements, for example Amazon's own offering or organizations with application programming interface good contributions, and OpenStack, an open source venture with a wide industry backing.

II. METHODS AND MATERIAL

The volume extensions single site or single foundation capacity to gathering or procedure, needful a structure that reaches above different goals. This remained the circumstance implied for the Higgsboson revelation, intended for which the dealing with was connected with the Google cloud establishment. Enlivening the route toward keen data by separating the figuring across over districts has shown reasonable moreover in various reaches, for instance, dealing with bio-informatics issues. Such remaining tasks at hand generally incorporate a colossal number of truthful analyses for bearing witness to conceivable huge locale of interests (for example interfaces among mind regions and characteristics). This taking care of takes showed to profit essentially starting transference transversely over goals. Other than the prerequisite for additional register resources, applications need to fit in with a couple of cloud providers „requirements, which expect them to be sent on topographically appropriated site.

Objective of the study

In the first place the organization use reduplication applications call the check reduplication (Data, Destination Site) ability to affirm in the Metadata Registry of the objective site if (equivalent) data starting at now exist. The check is done in perspective on the exceptional ID or the hash of the data. If the data be available, the trade is superseded through the report of the data at objective.

This takes the best increases, together period and money sagacious, among totally thickness techniques. Then again, if the data exist not authoritatively show

at the objective site their results for different improvement frameworks. By using the in advance exhibited advantage for assessing the cost, the georeplication administration can improve the procedure for cost or execution period. To this reason, applications are outfitted with an optional limitation when do the limit. By contrasting the estimation regarding this matter parameter in the segment of zero and one, applications resolve exhibit a more noteworthy greatness for rate (for example an estimation of 0) or for period (for example an estimation of 1), which in this way will choose the proportion of advantages for use for rehashing the data. This remaining parts wrapped up by scrutinizing the cost estimation advantage for the base moreover outrageous conditions, the specific value figures, and after that using the game plan rule as a slider to take in them.

Mass can even now possibly be diminished by relating weight figurings. Notwithstanding whether to contribute vitality and resources for put on such a computation and the assurance of the count herself are decisions that we consent to customers, who recognize the solicitation semantics.

We will probably make precise estimations anyway meanwhile to remain nonexclusive with our model, paying little regard to the pursued estimations or the earth variability. The organization underpins customer instructed weight related decisions, that is, pressure time or pressure cost get estimation.

Scope of the study

The multi-site cloud is involved a couple of geographically coursed server ranches. An application that has various running events in a couple of associations over various cloud server homesteads is insinuated as a multi-site cloud application. Our focus is on such applications. Disregarding the way that applications could be passed on across over locales having a spot with

different cloud venders they exist available of the degree of this work.

III. METHODS AND MATERIAL

Changing geo-contrasts into geo-reiteration requires the data or the state of employments to be scattered transversely over regions. Data improvements are period and resource consuming and it is in proficient for applications to intrude on their guideline count with a particular true objective to perform such activities.

Applications demonstrate the data to be persuaded and the objective by methods for an API work offer, i.e., Duplicate (Information, End). By then, the organization plays out the land generation by methods for multi-way trades, while the application continues persistent. Rehashing data opens the potential Cloud, and uncover its suitability in gigantic data contacts cook cornered over geologically evacuated limit goals, server ranches, and collaborating foundations[3].Writing study is key visit to explore the issue zone and handle start to finish learning on related field, which can be essential disclosure to get stress of the present issue. In the district of gigantic system improvement, we have to guide distinctive essential gathering to know the issue legitimately. In any case, real test begins when we have to choose devices and improvements which could suit best to deal with the proposed issue [4].Writing study encourages us to find the reasonable most capable approach to address the issue, which would just not handle the issue, yet rather in a gainful and least requesting possible way [5].

IV. LITERATURE SURVEY

The issue of booking data moved work forms in fogs tolerating that records are reproduced in various execution locales.
On the other hand, end-system parallelism can be abused to upgrade use of a private route by

techniques for parallel streams or synchronous trade. Nevertheless, one should in like manner consider structure plan since specific adjacent objectives may present bottlenecks. One issue with all of these techniques is that they can't be ported to the mists; in the interim they certainly rely upon the basic framework topology, darken at the customer level.

In this system, we propose Overflow, a totally automated single and multi-site programming structure for coherent work forms data organization. We propose a methodology that improves the work procedure data trades on fogs by techniques for flexible trading between a couple intra-site record trade shows using setting information. We build a multi-course trade approach transversely over center points of various server farms, which complete transmission limit with regards to capable between goals trades.

In this paper an option using data area over the span of direct record trades flanked by the register center points. The structure for record organization was orchestrated inside the Microsoft Non unequivocal Specialist work procedure engine and was endorsed using built benchmarks and unquestionable apparatus on the Purplish blue cloud [1].This framework really manages the e-Science undertaking adventures for stock reason. It gives cloud administration types to intelligent data organization, examination and participation. It is a flexible structure and can be passed on both private and open fogs. This paper depicts the arrangement of e-SC, its API and its usage in three particular relevant investigations soul data portrayal, restorative data catch and assessment, and development possessions expectation [2].   In this proposed framework we are depicting the WAS exchange worldwide and demonstrate the data in succession request, as we get the basic arrangement.

V. EXISTING SYSTEM

The calculated plan of the layered design of Overflow is displayed in Fig. 1. The framework is worked to help at any level a consistent reconciliation of new, client characterized modules, move strategies and administrations. To accomplish this extensibility, we decided on the Management Extensibility Framework, 1 that permits the production of lightweight extensible applications, by finding and stacking at runtime new specific administrations with no earlier arrangement.

We structured the layered engineering of Overflow begin in from the perception that Big Data application requires more usefulness than the current put/get natives do. Along these lines, each layer is intended to offer a straightforward API, over which the layer above forms new usefulness. The base layer gives the default "systematized" API for communication. The center (the board) layer expands on it an example mindful, elite exchange

The handiest alternative for dealing with information disseminated over a few data centers is to depend on the current distributed storage administrations. This approach permits to exchange information between subjective endpoints by means of the distributed storage and a few frameworks with a specific end goal to oversee information developments over wide-zone systems receive it.

Other than capacity, there are few cloud-gave administrations that emphasis on information dealing with. Few of them utilize the land circulation of information to decrease potentials of information exchanges. Amazon's Cloud Front, for example, utilizes a system of edge areas around the globe to store duplicate static substance near clients. The objective here is not the same as our own: this approach is important while conveying vast famous items to many end clients. It brings down the dormancy and permits high, maintained exchange rates.

VI. CONCLUSION

The project presents Over-Flow, an information administration system for logical work processes running in huge, physically spread and extremely powerful conditions. Our framework can successfully utilize the rapid systems associating the cloud server farms through advanced convention fine-tuning and blockage shirking, whereas outstanding non-meddlesome and simple to convey. Over-Flow exists utilized as a part of generation on the Azure Cloud, as an information administration backend for the Microsoft General Operative work process motor.

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An Application of Autocraft Workshop

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ABSTRACT

Autocraft Workshop is a software application developed in C++ language, implementing Object Oriented Programming and file handling to make the process of service of Automotive service centers more easy and efficient. This paper provides a customer centric interface in order to provide the best possible service and satisfaction to the customers. In addition it makes the overall service process much faster and helps to keep track and record the entire service data. It is beneficial for the customer as well as the store to keep track of the progress of the service and thus helps the company to improve their response to customer requests. Time is a very valuable asset for the customers and the company as well, and hence this application focusses on reducing the waiting and processing time involved in the service delivery. It provides the company to store their entire data in the database. The store also enables the customers to purchase the parts in-house and hence reduces the effort of procuring them. This software application eliminates the hardships and ineffectiveness of the manual service management system and provides a computerized solution to several problems existing in the service sector.

Keywords : Autocraft Workshop, Object Oriented Programming, Service management.

I. INTRODUCTION

Creates an effective customer-centric application for the functioning of an automobile workshop company using the concept of object orientedprogramming to improve the efficiency of the organization along with customer satisfaction.Provides a feasible computerized solution to manage the large volume of simultaneous processes in the organization.Creates an optimal application to provide ease of service to the customer. And provides the best possible solution to the organization to manage and handle their customers and deliver optimum services efficiently.Organizes the functioning of the service lines in order to coordinate the inter-related dependent working of various services.Offers various diverse services required for the periodic maintenance of vehicles to the customers.Enhances the quality of goods and services offered by increasing the investment of the company on machinery and products rather than traditional methods of service and labor.Maximizes the financial benefit of the company as well as the customers by providing quality service to a large number of customers effectively.Increases time management and eliminating the need for the customer to wait for their service to be delivered, and providing the status of progress of the service to the customer so that they can plan accordingly.Builds a good reputation for the

organization by delivering service at the promised time and ensuring satisfaction of the customer.

II. MOTIVATION BEHIND THE WORK

To simplify and enhance the process efficiency of the automobile service sector in order to provide customer satisfaction as well as increase the quality of service delivered and also to produce a customer oriented solution to the service industry.

III. ALGORITHM

1. Ask for INPUT from the user, from the following options.
   A. View all services
   B. Book a Service
   C. Get a Quotation
   D. My Account
   E. About us
   F. Store
   G. Exit
2. If the INPUT received is from the following options:
   A. View all the services provided by the company, based on categories and type of service, with the split up costs.
   B. Book a Service –
   i. Accept an INPUT from the customer if the vehicle is a two wheeler or 4 wheelers.
   ii. Accept INPUT for Brand, Model and Vehicle Number.
   iii. Display the list of service packages from the corresponding database containing all the service details.
   iv. Accept INPUT for the service the customer wishes to avail.
   v. The base class contains the basic service and the derived classes contain different additional services and the respective class is used based on the user input.
   vi. Accept the customer contact details.
   vii. Accept INPUT if the customer wishes to have a delivery/pickup.

viii. If YES, then accept the address and store it in the database. ELSE continue.
   ix. Create a respective object for the vehicle based on the service chosen.
   x. Store the customer details in the customer database.
   xi. Process the servicing of the vehicle and mark the vehicle in the active services file.

   C. Get a Quotation –
   i. Accept an INPUT from the customer if the vehicle is a two wheeler or 4 wheelers.
   ii. Accept INPUT for Brand, Model.
   iii. Display the list of all services from the corresponding database containing all the service details.
   iv. Accept INPUT for the service the customer wishes to avail.
   v. Find the quotation for the accepted data in the database and display it. [The default services of all the vehicles are stored in the base class and all the additional services are in the derived class.]
   D. My Account –
   i. Ask for INPUT from the user from the following options.
   a. Service Status
   b. My Profile
   c. My Bill
   d. My Cart
   e. Exit to main menu
   ii. Based on the INPUT perform the following:
   a. Search for the current customer's details in the active and completed services file and display the corresponding message.
   b. Search for the current customer's details in the customer services file and all the records of the customer (if any) are displayed.
   c. The current bill amount for the service availed is taken from the respective function of the respective class and also the cart is checked if any amount needs to be added to the bill. If cart is not empty that product amount is added to the service

bill. Polymorphism is implemented by using function overloading and passing different parameters.

d. The cart of the current customer is displayed based on Input of products made previously.

e. Exit to Main Menu

E. Admin Login –

i. Display options and accept INPUT from the following options:

a. View all Active services

b. View all Completed services

c. Change the status of the service.

d. View/Update the stock of accessories and parts

ii. Based on the input perform the respective operation.

F. About us –

i. The Information about the company is displayed

ii. The contact details of the company are displayed

G. Exit –

The program is terminated and an appropriate message is displayed

IV. PROPOSED ARCHITECTURE
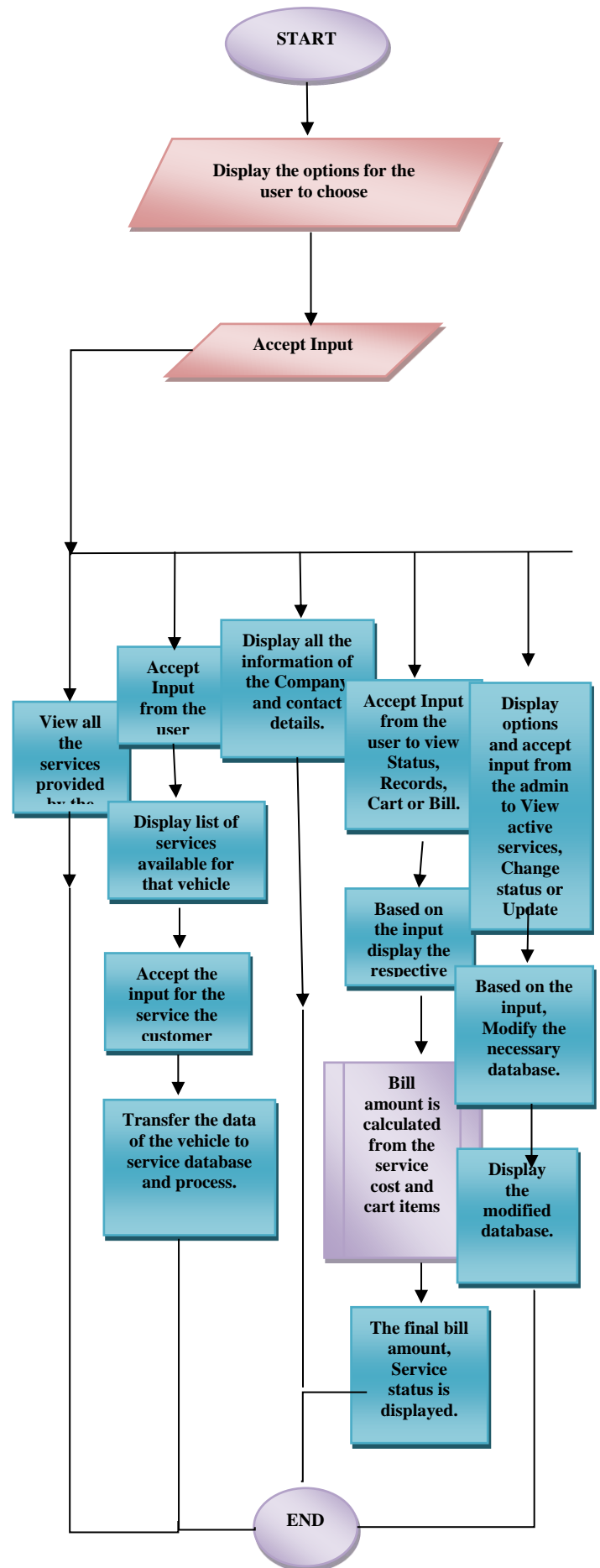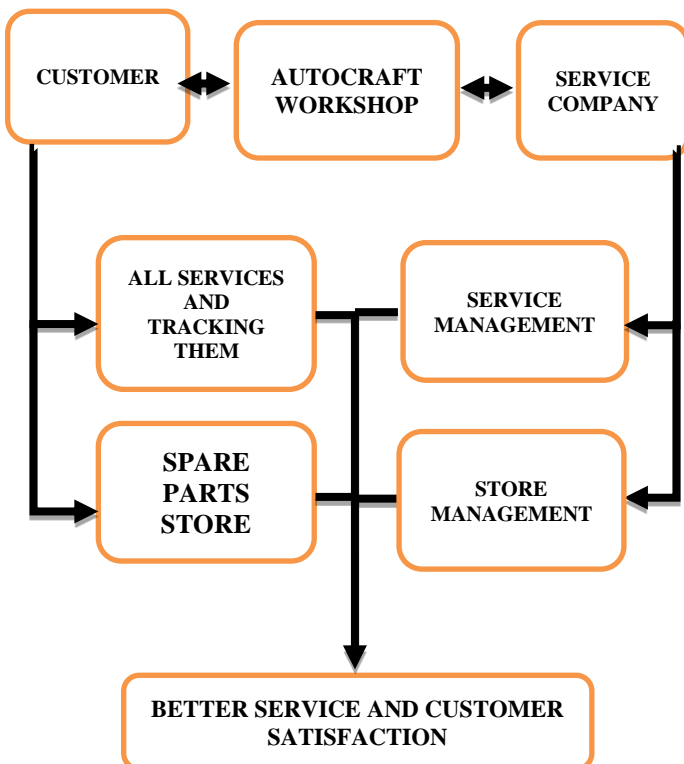
V. RESULTS AND DISCUSSION

Fig. 4.1

The above options are displayed to the customers when they get into the customer portal by logging in as customer. The user can choose from any of the above options to perform the respective task, and the respective function is invoked.
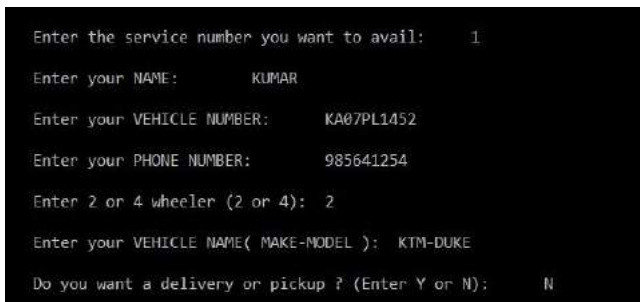
Fig. 4.2

The above figure shows the booking screen for a customer when the booking option is chosen from the previous screen. The details of the customer are accepted and stored in the file system and retrieved later when needed by the various processes of the application.

Fig 4.3

The above figure shows the interface when a customer selects a service and requests an estimate. The estimate shows the various components involved in the service and their costs and the total cost of the particular service, along with the various services covered.
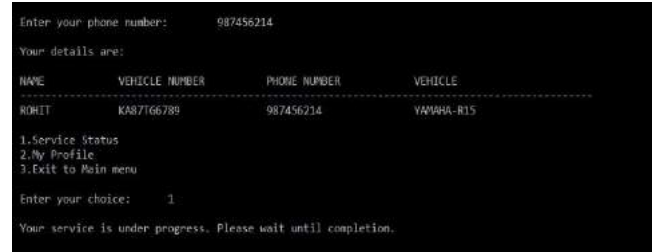
Fig 4.4

The customer can view the current status of their vehicles and hence do not have to wait at the workshop without knowing if their service has been completed. This saves time for the customer and the organization and makes the application more efficient.

Fig 4.5

The above options are displayed when a workshop administrator logs in using the admin option. The details of the customers are displayed and also various other options for the administrator to manage the customer records. The administrator can choose from any of them for the respective operation.
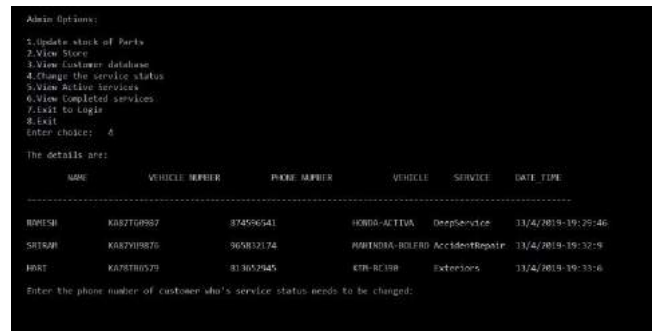
Fig 4.6

The administrator can change the status of a vehicle and hence reduces the need for a customer to wait and the customer can plan their vehicle pickup according to the status, and hence reduces the waiting time and helps the organization deliver more efficiently.

VI. CONCLUSION

The goal of this project is to create an efficient, economical and effective service management application for an automobile workshop to manage the heavy load of customer demand in a more beneficial manner for both the customer as well as the company.This objective has been achieved by using the concepts of Object Oriented Programming in C++ in order to create the necessary application based on the principles in OOPS such as data abstraction, encapsulation, polymorphism, Inheritance and Classes and Objects.This method is one of the most effective methods as it has provided a both user friendly as well as a capable application software to meet the needs of the company as well as the customers.This software has been made on the lines of enhancing our programing knowledge in C++ and Object Oriented Programming Concepts, and has been a great informative, interesting and an innovative experience in the process of creating this application.

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Natural Language Processing – Interaction between Humans and Machines

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ABSTRACT

Natural Language Processing is the technology which used to aid computers to understand the human being's natural language, which is not an easy task to complete because humans can easily master a language, the ambiguity and imprecise characteristics of the natural languages are what make NLP difficult for machines to implement.

I. INTRODUCTION

NLP is sub field of computer science, information science and artificial intelligence which helps to develop the relationship between human and machines. In machine learning NLP has gained lots and lots of knowledge due to the critical need of understanding the text, with its varying structure, implied meanings, sentiments, and intent.

Computer programming will never be able to convert a piece of English language into a programmer friendly data structure that describes the meaning of the natural language text. Natural Language Processing (NLP) have removed many of the communicating barriers between humans and machines by translating machine language into human language and by providing opportunities for humans to accomplish tasks that were not possible before. NLP jointly enable automatic tools to uncover meanings from raw data in use of security applications and fraud detection.

II. WHAT IS NLP?

In Natural Language Processing, the Machine Learning training algorithms researches millions and millions of examples of text, words, sentences, and paragraphs which is written by human's beings. Training algorithms after studying the samples gain an understanding of the context of human speaking, writing, and other modes of communication. This training helps Natural Language Processing software to differentiate between meanings of various texts.

Natural Language Processing is a subset of AI and it converts data into natural sounding text the way it is spoken or written by a person. In daily life, people probably come across many instances of NLP without realizing it. When you ask Alexa, Google, Cortana, Siri for a forecast for directions, NLP is at work behind the scenes.

The five important phases of Natural Language Processing (NLP) involve Structure analysis, parsing, semantic analysis, discourse integration, and pragmatic analysis and also some well-known application areas of NLP are Optical Character Recognition (OCR), Speech Recognition, Machine Translation and Chatbots.

Important Phases of Natural Language Processing:
1.Sentiment Analysis:

It refers to the use of natural language processing, computational linguistics, and biometrics to minutely identify and study affective states and subjective information. It is largely applicable to the customer materials in survey responses and social media also healthcare materials for applications that range from market products to customer service and to clinical medicine.

2.Information Extraction:

The Extraction of Information is method of automatically extracting the structured information from non-structured information or semi- structured information machine languages. In many cases this process concerns processing human language texts by NLP.

Smart Search:

Smart Search understands the meaning of the search query, disambiguates topics, provides a uniquely rich set of search choices, recognizes URLs and the content on the respective page, good with very short phrases. Smart Search's ontology is continuously updated by professional linguists and search is available in more than 30 languages and works across many languages.

III. STEPS INVOLVED IN NLP IMPLEMENTATION

These are the important steps which is used in Natural Language Processing:
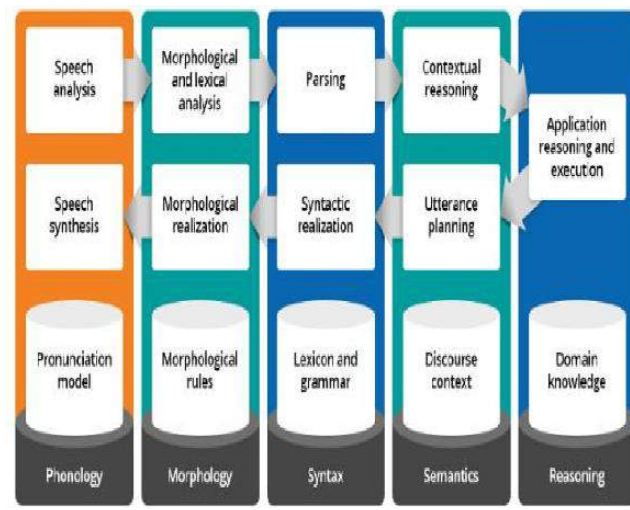
IV. THE MYTH SURROUNDING NATURAL LANGUAGE PROCESSING

Natural Language Processing is the technology that analyses and arranges the data into comprehensible and written text. Natural Language Processing operates the machine in providing solution through many variables also delivering natural-sounding sentences and paragraphs that observe the rules of English grammar.

With the help of Natural Language Processing, Data Scientists are free to dive directly into Data Analysis without worrying about data preparation methods. With the very well-known NLP vendors in the market these days include Arria, Narrative Science, and BeyondCore, which was recently acquired by Salesforce.

Success Story of Natural Language Processing:

Many market watchers have offered their insights and expert views on Natural Language Processing in various market report. Some surveys and organizations encapsulates the most significant findings of those market reports, and offers convincing arguments in support of the technical

functionality of conversational interfaces that have already gained market clout.

Some companies like IBM, SAS, SAP, Oracle have started their own Text Analytics Solutions which indicates that stand-alone Text Analytics vendors may soon find it difficult to market their solutions with so many larger IT players offering lots of solutions.

V. EXAMPLE OF NATURAL LANGUAGE PROCESSING
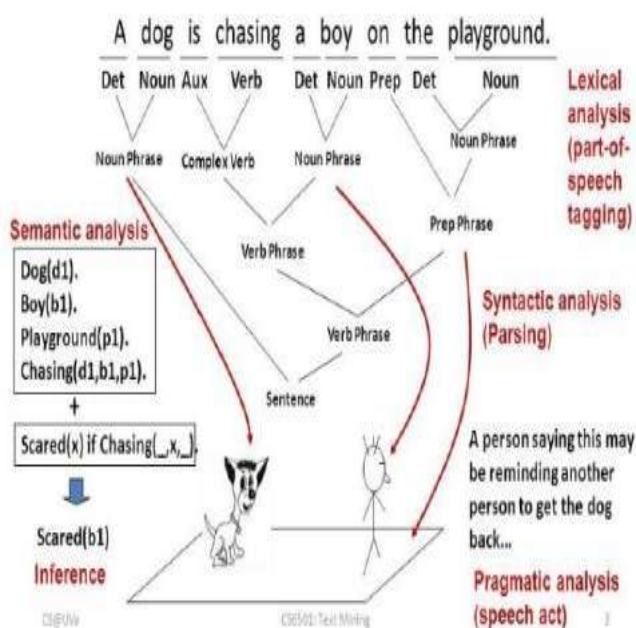
VI. CONCLUSION

Natural Language processing makes the employment easier but also demands a human interference because it cannot work without human inputs. It is based on deep learning. NLP tries to find a relationship between samples of data and collect them together into the desired and worth outcome. This algorithm also uses descriptive and predictive analytics to come to results.

In the age of big data analytics when the Internet of Things (IOT) is growing very fast, the maintenance of huge chunk of data is posing a problem that demands quick attention. Manipulation in the data big data can be hence achieved by Natural Language Processing wherein the advanced version of NLP can prove to be extremely useful.

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Disclosure and Sniff out of Moving Entity in Real World

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ABSTRACT

Entity disclosure & sniff out is being studied from years together and is one of the area where research is constantly carried out. In today's world it is a great challenge to generate an approach which is robust, accurate & high performing. How an entity is disclosed & sniffed out is defined as one of difficult task. One of the visual features, say a particular color is used as representation of an entity then the method discloses as a entity all the pixels with same color. On another side it is very hard to disclose accurately the face of particular person with full details (different actions & lightning changes) and to recognize, track. The biggest challenge is tracking entity in a video, since the entities are in motion. If a camera is fixed at appropriate point, as the entity moves in the area covered by it there is dramatic change in the entity image. This change occurs from three sources: if there is any change in the target posture, lightning changes and Due to change in camera setup property it is not possible either partially or fully to see what we wished to see.

The videos that are captured under various environment needs to be understood in order to know the activities of entity, the task is very challenging and is used by many applications for companies, scientific research, educational institutions. What motivated in studying this problem is to create a system where moving entity surveillance in real time can be disclosed and sniffed out.

I. INTRODUCTION

The information that are gathered from multidimensional data or images are used by computer vision for building artificial system and computer vision is more often studied for motion detection. There are two ways by which motion of an entity can be disclosed: Region-based approach and Boundary-based approach. Region-based approach do not use any model for motion disclosure, some of the technique are Background Subtraction [1] and Optical flow. The moving entity can be disclosed in Background subtraction by eliminating the

calculated background model from the image. Lightning changes and any small movement in the background can be easily detected making the method more sensitive and time absorbing. The optical flow methods approximate constraint equation ignores temporal lightening changes making it unsuccessful.

Many of the boundary-based approaches make use of level sets, effective contours [2], margin based optical flow. Moving margin can be detected by calculating each pixels zero crossing from the complexity of intensity history with Gaussian function second order physical derivative. If the

image is not steady to sufficient amount, the results will be inaccurate because the velocity is computed without considering neighboring pixels spatial information

Random noise is experienced by many of the existing margin pixel based approach, matching of margin segment pixel by pixel results in high estimation cost. In the current margin pixel based method the margins that are not visible in the current frame might be visible in later frame and it is not possible at a time to apply different amount of transformation to different parts of pixels edges. As a consequence all parts of the object model cannot match accurately in subsequent frame. This phenomenon makes the disclosure of complex motion and shape change situation a difficult task

The proposed system is tough in different situations including indoor and outdoor locations and various kind of background location. The method proposed is tough because the method uses margin based features and then clustering is used which makes it unresponsive to lightening modifications. The area enclosed by margin based feature is lesser than region based feature and not computationally costly, hence making the method faster. The proposed application can be deployed in number fields such as:

· Bank survey, shopping marts, airports, private assets and parking zone

· To safeguard highways and detection of accidents in railway

· Checkup of the old age people's activities and to intimate for medical treatment.

· Accounting of Endangered species

· Logging tasks at nuclear and industrial facilities

2.1 A Motion and Shape based Pedestrian detection Algorithm, Hadi Elzein, Sridhar Lakshmanan and Paul Watta

In this paper [18] vision based pedestrian detection is investigated for the intelligent vehicle system design. The algorithm is feed with the video that is captured by camera placed on the vehicle. For the

video frames wavelet transform is calculated and multi scale template matching is used to resolve pedestrian presence or absence in frame. Computational need can be reduced by motion detection and location. Results were given for various sequence of video and the method was able to accurately detect pedestrian in crowded scene.

2.2 Split and Merge data association filter for dense multi-target tracking, A. Genovesio and J. C. Olivo Marin

In this paper [11] Bayesian target tracking method, filter the subsequent measurement from detector. If there are multiple targets or crowd, then the filter must be connected with association scheme. In classical Bayesian multi target sniff out method depend on assumption that a destination can make at most one evaluation per scan and a evaluation emerge from at least one destination. When a large number of changing sources are tracked .The assumption mentioned before are not meet leading to failure of existing method. Here, an algorithm has been proposed which allows tracking when individual destination generates many measurements or many destinations generate individual measurement. Here, a virtual measurement set displace and enhance the measurements and is done in two steps: i) By dividing and integrating the actual measure a viable joint association is built .ii) Among all the viable joint association the joint probability is raised. The method was tested on teeny image sequence which contained more moving object.

2.3 Multi target tracking with split and merged measurement, Z. Khan, T. Balch, and F. Dellant

In computer vision many of the multi targets tracking application provide a detection algorithm that could locate potential targets. The measurement is coupled with target trajectories that are predicted long ago in data association step. The output from the detector is not perfect and multiple divided measurements is generated from individual destination and single combined measurement from many destinations. This problem can be solved in the

paper [14] by introduction of multiple hypothesis trackers for cooperating targets that produce split and merged measurement. The tracker is based upon Markov Chain Monte Carlo particle filter. Particle filter is Rao-Blackwellized such that state parameters which are continuous are analytically calculated and MCMC sampler produces samples from data association

2.4 A real time object detecting and tracking system for outdoor night surveillance, Kaiqi Huanga, LiangSheng Wang, Tieniu Tan, Steve Maybank

In this paper [15] we study detection and tracking of objects during night. There is a rich history on independent video supervision and monitoring. Number of setup systems, reliably traces the movement of humans in indoor and guarded outdoor environment. The detection and tracking during night is one of the major problems in visual surveillance. The objects to be detected are far away, very teeny and their signature have less distinction across the background. In this paper an algorithm for night time visual surveillance has been proposed for detection of objects in real time and is based on variation analysis. In the initial step the variation over time is used for detecting possible moving objects. False alarm could be suppressed by predicting the motion and data of nearest neighbor. Experimental results show the effectiveness of algorithm in detecting and tracking of objects in night time

2.5 Fitting multiple connected ellipses to an image silhouette hierarchically, Richard Yi Da Xu and Michael Kemp

In this paper [3] we pursue to fit model of united ellipse to an image silhouette. Some of the algorithms who have tried are sensitive to guesses and meet in wrong solution while attempting to reduce objective function in one step for the whole ellipse structure. We have presented an algorithm which swamped these issues. In the first step connections are ignored temporarily and initial guess are refined by making use of uncontrolled Expectation –Maximization (EM)

for a variety of Gaussian densities and the ellipses are reunited linearly. At last Leven berg-Marquardt algorithm is applied to ellipse shapes for fine tuning and is aligned with contour. Experimental result showed that algorithm is able to fit robustly the ellipse structures which are complex to the respective shape for many applications

2.6 Automatic detection and tracking of pedestrian from moving stereo-rig, Konrad Schindler, Andreas Ess

In this paper [6], the 3Dimensional pedestrian detection and tracking is performed in urban traffic scenes on a stereo system. The probabilistic environment model blends the dense 3D reconstruction evidence and detection of pedestrian which are image based into constant classification of the scene observed and tracking for the reconstruction of trajectories of pedestrian in 3D coordinates. Experimental results on busy inner city are presented where promising results were achieved.

2.7 Bayesian visual Surveillance: Model for detecting and tracking a variable number of moving objects, C.R. Del Blanco, F. Jaureguizar and N. Garcia

This paper [8] detects and tracks the objects in visual surveillance system where it can hold number of moving objects. The tracking task becomes difficult when the detector generates a noisy, improper and misplaced, split and merged measurement of the video objects. The detections of split measurement is a challenging task where a single object is separated into many measurement and merged detections where many objects are combined into single detection. Some of the approaches were able to address the problem straightly and current one use interesting methods say by assuming number of objects but are not applicable for online applications .The stochastic process handles the split and merged measurements by making use of particle filter approach interference is exactly measured. High performance is achieved in the real time.

2.8 Visual Tracking of Multiple Interacting objects through Rao-Blackwellzed Data Association Particle filtering, Carlos R.del Blanco, Fernando Jaureguizar and Narciso Garcia

This paper [10] presents multiple objects tracking with capability to handle interaction among complex objects, detections of missing and clutter data. The proposed system is able to handle complex condition where the objects that are interacting change their gesture while obstructed. This is estimated by assuming the location of obstructed objects. Rao-Blackwellized Data Association Particle Filter (RBDAPF) is used for designing tracking. RBDAPF consists of compliant substructure to calculate the position of object. Measurement of the objects is approximated using particle filtering. The computational cost can be reduced by using filter decomposition because as the number of objects increases the complexity becomes linear than exponential. Particle filter manages to efficiently measure the objects in visible and obstructed scene. The Result shows that RBDAPF tracks many collaborating objects under complex locations.

2.9 Fast and robust algorithm of tracking multiple moving objects for intelligent video surveillance systems, J. S. Kim, D. H. Yeom and Y. H. Joo

In this paper [7] study of video supervision systems is being carried out which deals with intelligent image processing. Technology of detecting and tracking moving objects is made use in customer electronics like home and business supervision system subsisting of IP camera and NVR.A real time supervision system must robustly detect objects that are moving in noisy environment. Proposed method make use of Red-green-blue (RGB) background modeling to select moving sector with the help of susceptibility parameter, the noises and blob-labeling are ignored and analyzed in order to group objects that are in motion. Faster tracking of moving objects can be achieved by predicting the acceleration and the order of group setup by moving objects. The experimental results show that the method is tough across the environmental effect and quickness,

which is applicable to the real time supervision system

2.10 Behavior Subtraction, Pierre-Marc Jodoin, Venkatesh Saligrama, Janusz Konrad

In this paper [17], Background subtraction is a driving engine for video analysis and computer vision. Many variants of background subtraction exist, which is based on hypothesis that photometric scene effects are stationary or show temporal stationary. The model fall's when one is excited in identifying variations in the scene gesture rather than variations in the photometric characteristics, for example detection of pedestrian exhibiting unusual activity or vehicle traffic. The paper proposes a model and framework which considers the gesture of the scene not its brightness, to be static, i.e a changing background play as reference for the gesture grabbed over a time period at a particular location in the camera field of view. Compared to the earlier work vector object descriptors compute events by combining multiple features like object size, order of movement, speed. Events are handled probabilistically with low memory, low complexity. A new algorithm behavior subtraction is effective & efficient inconsistency detection and localization. Behavior subtraction is volatile to false background movement, say camera jitter & content blind. Behavior subtraction opens new possibilities to video analytics by treating video group of events than colored pixels.

II. CONCLUSION

Disclosure of multiple moving entities can be achieved by the new algorithm which is tough and accurate. The proposed algorithm consumes small amount of memory and complexity involved in calculation is also small. The power of proposed method deceit in capacity to sniff segments in consecutive frames .The margin segments size and configuration vary from one frame to another and in certain case few segments may screen for one or many frames and returns back by its own.

The proposed method handles fluctuation in margin successfully by making use of weighted margin segment .By the introduction of limited margin segment matching, entity sniffing helps in construction of association among frames with in margin segment. The accumulation of knowledge about the changing margin shape within each array is done by prediction and inter frame model. Among the successive frame definite array location can be determined. While clustering the margin segment some of the array combines when there is a overlap between array boundary which is having same weight and motion order. The clustering algorithm is suitable for broader database and can be used for huge number of array; there is less time and space complication.

In sniff out algorithm, full blockage of moving entity cannot be handled, which is one of the future work. Incorporation of model that process arrays can be made use as well necessary movement can be extracted from scene and the number of entities can be calculated in the scene. By incorporating the color of margin side into array together with its quality, will help sniffing various overlapping arrays correctly

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Design of UGV for Searching and Saving Lives of Lost Persons in Natural Disasters and Military Using GSM Zig-Bee

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ABSTRACT

An unmanned ground vehicle (UGV) is a vehicle that operates while in contact with the ground and without an onboard human presence. UGVs can be used for many applications where it may be inconvenient, dangerous, or impossible to have a human operator present. Thinking on the general SAR context, when a small plane crashes in a remote area, or a fishing boat is lost at sea, or a hurricane devastates a region, or simply a person gets lost while he/she was hiking, SAR teams must scan vast areas in search for victims evidence or wreckage.a hybrid multi-sensor navigation system has been developed, benefitting from the GPS system performance and exploring the use of RIMU sand barometer to assess the potential of lower-cost, highly-redundant.

Keywords : hybrid multi-sensor, wreckage, SAR

I. INTRODUCTION

The UGV is the land-based counterpart to unmanned aerial vehicle and remotelyoperated underwater vehicle. Unmanned robotics are being actively developed for both civilian and military use to perform a variety of dull, dirty and dangerous activities.

The Defencedepartment response was to create the Joint Robotics Program (JRP). As a result of this interest and the efforts by the Department, the forces operating in theatre today will employ nearly 4,000 robots by the end of calendar year 2006. These robots are accomplishing high risk missions while simultaneously reducing the loss of life and limb among the Service members serving in European Command (EUCOM), Iraq, Afghanistan, and other Central Command (CENTCOM) locations. Today's battlefield environment unequivocally demonstrates the military utility of robotics applications in combat. More and more robots are being destroyed or damaged in combat instead of Servicemen and women being killed or wounded, and this is the preferred outcome [1]. As robotics technologies proliferate and applications spread to other mission areas in combat service and Service support, robotics will play an increasing role in the success of a broadening range of future force missions. The Department is responding to these trends by positioning itself to further exploit the promise of robotics technology [9].

Unmanned ground vehicles (UGVs) today are saving lives and providing critical supporting capabilities in current military operations worldwide. A diverse combination of prototypes, commercial off the shelf (COTS) purchases, and fielded systems support our Joint forces in a variety of mission areas, including: improvised explosive device (IED)

detection and defeat, scout, explosive ordnance disposal (EOD), force protection (FP), countermining, unexploded ordnance (UXO) clearance, and more. UGV platforms in use today are sized to meet mission capability requirements and range from a hand launched throwbot prototype weighing less than a pound, to large systems like the Abrams Panther mine clearing vehicle weighing in at over forty tons. From the onset of the Global War on Terror (GWOT), employment of available UGVs and new capability needs from our forces have been rising steadily [3].

The Robotic Co-combatant Interaction Technologies task will demonstrate the ability for UGV to operate safely in a semi-autonomous mode in urban environments in the presence of soldiers, pedestrians, and other vehicles. The Robotics Collaboration ATO is expanding the tools, techniques, and autonomy to increase performance and increase effectiveness of Soldier-robot teams. The NAUS ATO develops and demonstrates key robotics technologies on an Armed Robotic Vehicle (ARV) scale mobility platform to reduce risk for PM FCS (BCT) [10].

II. RELATED WORKS

2.1 Current Military Operations

UGVs, in varying sizes to meet mission capability requirements, are today saving lives and providing critical supporting capabilities in current military operations worldwide. Included in the mix is a diverse combination of prototypes, commercial off the shelf (COTS) purchases, and fielded systems supporting our Joint forces in a variety of mission areas, including improvised explosive device (IED) detection and defeat, reconnaissance, explosive ordnance disposal (EOD) and force protection (FP).

2.2. Major Acquisition Programs

Developments in robotics and UGV system capabilities support current major defence acquisition programs of the Department of Defence (DoD) with the most obvious program being the Army's Future Combat Systems (FCS) Brigade Combat Team (BCT). In support of the FCS effort, Modeling and Simulations (M&S) have demonstrated that Armed Robotic Vehicles (ARV) supporting the Mounted Force have improved the survivability of Manned Ground Vehicles (MGV) and contributed significantly to the targeting of enemy forces. Furthering robotic developments, Service laboratories have conducted core research to enable levels of autonomous mobility needed for both current and future systems [2]. The Joint Ground Robotics Enterprise (JGRE, formerly the Joint Robotics Program (JRP)) has supported and continues to support technology maturity efforts that have enabled the fielding of the first generation of robotic UGVs providing a range of current force capabilities.

2.3. Department Programs and Activities (FY2004-FY2012)

There has been a steady increase in research and development activities, Service requirements, Congressional interest, and overall robotics investments since 1990 [7]. As technologies have matured, more systems have been fielded, and prototypes have made it into user hands for evaluation. Projections of total current and future DoD investments over the period FY2006-2012 approach $1.7B. DoD plans for near-term robotics investments are focused to leverage rapidly maturing robotics technologies and to meet rising warfighter capability needs for better UGVs.

2.4. Long Term R&D

The military importance of UGV technology is increasing rapidly. UGVs and other robotics now have capabilities to perform missions that are dirty, dull, and dangerous. Science and Technology (S&T) focus is being placed on near and far term research and development (R&D). Research efforts will transition to acquisition programs that will be integrated into the Army, Marines, Air Force, and Naval ground fleets and are described in greater detail in this section. Multiple avenues of technology development and maturation in such

areas as mobility, platforms, autonomy, human machine interactions and interfaces, and integration with other UGV and manned systems are being employed to increase the level of DoD unmanned ground system and robotics capabilities [5].

III. PROPOSED SYSTEM

3.1 Existing systems

3.1.1 Mountain rescue

Mountain rescue relates to search and rescue operations specifically in rugged andmountainous terrain. The figure below shows mountain rescue operation.

Fig.3.1.Rescue operation using rope in mountains

3.1.2 Ground search and rescue

Ground search and rescue is the search for persons who are lost or in distress on land or inland waterways. Traditionally associated with wilderness zones, ground search and rescue services are increasingly required in urban and suburban areas to locate persons [4]. Ground search and rescue missions that occur in urban areas should not be confused with "urban search and rescue", which in many jurisdictions refers to the location and extraction of people from collapsed buildings or other entrapments.

Fig.3.2 Rescue team

3.1.3 Air- rescue

Air rescue (ASR) refers to the combined use of aircraft such as flying boats ,floatplanes, amphibious helicopters and non-amphibious helicopters equipped with hoists and surface vessels, to search for and recover survivors of aircraft downed at sea as well as sailors and passengers of sea vessels in distress, autonomous UAVs(Universal Air Vehicles)use to rescue the survivors on land. The use of Unmanned Aerial Vehicles (UAVs) —more in general,Unmanned Aerial Systems (UASs)— for SAR operations isnot new and has been traditionally fed by developments made inother fields. The main driver of UAV technology has been (andstill is) the military field and this is because the nature of militarydevelopments is fairly overlapping SAR needs.

Fig. 3.3 Aerial rescue operation,

These techniques are very effective but cannot be carried out in many cases for manual like in the case of a mini jet crashes in an inaccessible and a remote place like the very dense of Amazon, Africa.Its very difficult to trace the missing person in the huge

forest, and if at all the person in the forest is found it is very difficult for the manual rescue operation to be carried out due to many life threatening creatures,and it really consumes a lots of man force to scan such a huge forest [6].

Whereas in the case of aerial rescue operation the aerial instruments are ineffective in forests since objects lying on the ground are not visible to these devices.

3.2 Proposed System

The disadvantage can be eliminated by making use of a ground based robot or unmanned ground vehicle(UGV).UGV or Unmanned Ground Vehicle are a medium sized autonomous robot which operate of their own and do not required any human control over it, hence if a certain range of area is given to be scan in search of a human then this device is very effective.

A large number of these robots are sent in the forest where the missing person is predicted to be there. These mini robots scan the whole area on the ground level and search for the missing person.

Hence it completely eliminates the danger of human life during the rescue operation and one of the best features of UGVs is it do notrequire any human to control it i.e.it is self controls itself and reduces man force.

Fig 3.4 UGV

3.2.1 Locomotion

The most basic problem facing UGVs is mobility, and the choice of locomotion affects the structure of the entire robot. To meet the stated requirements, the vehicle must have a flexible drive system which can adapt to the myriad of conditions and obstacles possible in collapse scenarios, while remaining simple and reliable enough for search and rescue work.

There many options (Table 1) when designing the robot, the first of which was a snake style motion using joints which would expand and retract. This option would provide exceptional manoeuvrability in a relatively small package. The addition of modular sensors and payloads would lead to increased mission flexibility. However, the speed of a snake-style robot is quite limited, and the mechanical complexities would mean a cost far greater than the allotted budget.

A second locomotion option was a hexapod design with insect-like legs. Legs are most easily adapted to the uneven terrain found in building collapses. However, each leg would require at least 2 joints and 3 degrees of freedom, which greatly increases complexity, both physical and programmatic, as well as cost. This increased complexity also decreases reliability and durability, which were two factors the team considered very important. With a minimum of four legs required for stability, the team decided that insect-like locomotion would be too complex, too costly and too fragile.

A more novel third option involved rotating screws placed on the outside of the robot. When spinning in opposite directions, they would propel the vehicle forward through almost any terrain. These screws (similar to a back-driven worm) provide lots of traction and would work in water. Unfortunately, the screw system cannot climb stairs, thus failing one of the team's key design criteria.

Large wheels were briefly considered as a fourth type of locomotion. Wheels would be the simplest, cheapest and most reliable option, as they require fewer motors and fewer moving parts. However, the mobility of a simple wheeled vehicle is severely limited, and a small wheeled robot would not be able to climb stairs. Placing a wheel at the end of a freely rotating arm would solve the stair-climbing problem, but there would be no traction along the length of the arm.

Using tracks on the arm instead of a wheel was the final option. Tracks supply traction along the entire arm without an increase in complexity over wheels on the end of rotating arms. This design would allow the robot greater mobility than simple wheels and more traction than a wheel on an arm. So depending on the environmental condition the type of locomotives is decided, but here in this model we make use of a simple wheel that can run on a flat surface for a demonstration and these wheels can be changed according to the surrounding.

3.2.2 Communication, Control and Power

The robot will be used in disaster areas inside collapsed buildings and around debris. It will likely be used in collapsed basements or in other radio frequency (RF) shielded environments. It is assumed that there will be no external coverage, such as cellular networks, in the case of natural disasters. The goal is to have a range of up to 150 feet line of sight for the initial prototype, less in confined areas with structural interference. Communication with the robot could be achieved in one of four ways:

The first option was to use a cable tethered to the robot at all times to provide power, communication and other functions such as a fresh water supply. Using a tethering cable from the base station to the robot meant that a battery would not be needed and operating time would not be an issue. Communication between controller and robot would be more reliable and less susceptible to interference. The tether could potentially create problems by snagging on corners of objects or tangling in steel debris. A tether would also have to be stored either on the robot or near the operator. The friction from pulling the cable could prove overwhelming for a robot of this size.

A second option was to utilize a WiFi router to handle all communications between the robot and base station. The popularity of this technology with consumers means that the cost is kept lower than other possible wireless solutions. Using a WiFi router in conjunction with a laptop computer eliminates the need for a dedicated transceiver pair. WiFi will also provide sufficient bandwidth for video streams from the robot provided the signal is free of interference.

Control of the robot would be done via one of several methods which could include a dedicated microcontroller or a processor programmed onto a field programmable gate array (FPGA). Another alternative is to construct a simple computer running an operating system, such as Linux.

A microcontroller can be purchased cheaply and is powerful enough for most functions. Positioning and most sensing could be done with the microcontroller, leaving video streams to another device. This approach would be very simple to design and implement quickly.

To be useful for search and rescue applications, the robot shall have at least 1 hour of runtime. It is assumed that only some of the motors will be run at any time, but power must be provided to all the electronic components continuously. Two appropriately-sized batteries were chosen due to current draw constraints.

3.2.3 Block Diagram

The main goal is to integrate a medium-size, robot type unmanned ground vehicle(UGV),for searching lost people in the natural disasters. UGV is built with camera for detecting the person using image

processing and video processing techniques for rescue purpose must know about the person's alive or not. Temperature sensor and pulse sensor or heartbeat sensor is used for detecting the condition of the person. Once the person is detected as alive the rescue team will get the person location through GPS Navigation system via GSM/Zig-Bee.
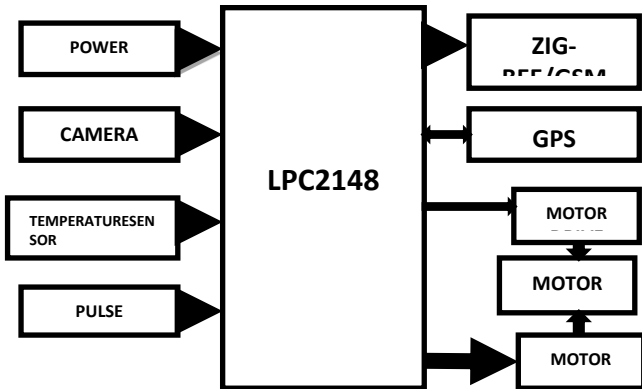
Fig.3.5. Block Diagram

All this sensors and protocols are interfaced in the LPC2148 microcontroller which has 32 bit and have 64 pins high performance ARM-7 in which only 48 pins are used by the user which are multi function pins operating at 3.3V power supply and has a oscillation frequency of 60Mhz.

Two motor drivers are used which are connected to a motor,these motor drivers are nothing but just like a relay which act as a switch used to turn on the motor which indirectly help the vehicle to move.

3.2.4 Algorithm for temperature sensor

Steps 1:The sensor sends the analog signal to the microcontroller.

Step 2:ADC 0,1 converts the analog signal into digital.

Step 3:The digital value will be converted into degrees using the formulae

Temperature =(ADC_value)/19.37

Step 3:Depending on the temperature w.r.t. the threshold.

Step 4:Send a message to the number provided with the exact location of site of accident.

3.2.5 Algorithm for pulse sensor

Step 1:Activate the pulse sensor.

Step 2: Start the timer for one minute.

Step 3: Simultaneously sensor transmit and receive the wave at micro seconds.

Step 4: After one minute stop the timer.

Step 5:Convert the count into pulse rate.

Step 6:Depending on the measured pulse rate w.r.t. the threshold level.

Step 7: A message is send accordingly (alive or dead)

3.2.6.Algorithm for image processing

Step 1: Clear all

Step 2: Activate the camera and start a video.

Step 3:Take the images from the video and store the image in x.

Step 4:Subplot the image in rows and columns and display it on the screen.

Step 5:Crop this image into 40*40 pixel and check for a human face.

Step 5:Face is detected using the protocol Cascade object detection and displayed it on screen.

Step 6: Once the face is detected control is send to the controller.

IV. SIMULATION AND RESULTS

The steps involved in executions are as follows.

Step:1 Motor is switched on and the search operation starts, with the message displayed on the lcd.

Step 2: The camera starts searching for people and displays objects around it as seen below.
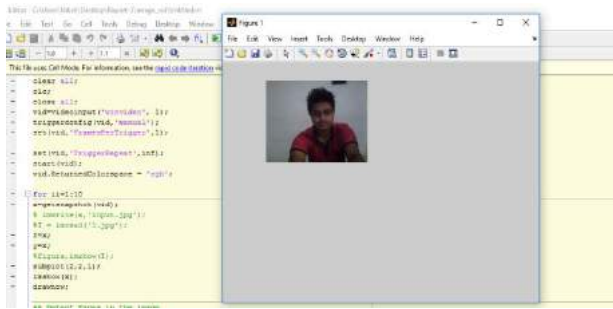
Step 3: The captured image is cropped and the face is detected and displayed on the screen.
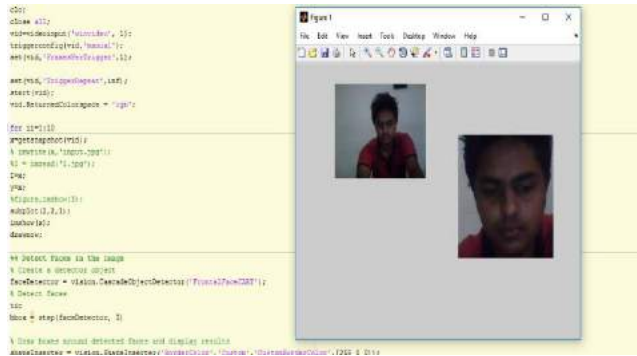
Step 4: Following that a message is sent to the number provided with the message of "human detected".

Step 5: The location of the site is also send to the number.

After detecting the human temperature of the body is measured and displayed on lcd.
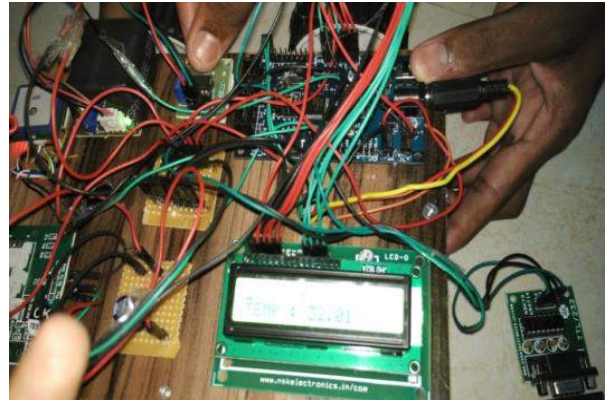
Step 6:If the temperature is found to be normal then a "normal body temperature " message is sent.

Step 7: Finally the pulse rate of the body is calculated and message of alive or dead person is sent accordingly.

V. CONCLUSION

The proposed system is designed to integrate a medium-size, robot type unmanned ground vehicle (UGV),for searching lost people in the natural disasters. UGV is built with camera for detecting the person using image processing and video processing

techniques for rescue purpose must know about the person's alive or not. Temperature sensor and pulse sensor or heartbeat sensor is used for detecting the condition of the person. Once the person is detected as alive the rescue team will get the person location through GPS Navigation system via GSM/Zig-Bee.

While budget was a limiting factor for the features included in the robot, it did not limit the imagination of the team. Among these ideas were several improvements to the existing equipment as well as quite a few new features. The prototype designed by the team has only one camera, placed at the front of the vehicle. This presents a problem if the robot gets stuck in a dead end and has to back out. To nullify this, the team originally planned to have a second camera in the "rear" of the robot to allow reversing direction without driving blind.

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A Review on Face Emotion Recognition Techniques

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ABSTRACT

Emotion recognition is categorizes as one of the challenging and important task in image processing fields. The image processing junctures comprises of three steps: pre-processing, feature extraction and classification. Image Processing is a rapidly developing area with growing applications in Science and Engineering field. Image Processing holds the possibility of developing the eventual machine that could perform the visual functions of all living beings. Facial emotions are contemplate to be the important source of information which is a common requirement for human to express their emotions.

I. INTRODUCTION

Human facial emotions are eminently necessary in social communication. Normally communication imply verbal as well as nonverbal. Non-verbal communications are expressed in terms of facial expressions. Non-verbal communication implies communication through eye contact, gesture, facial expressions, body language, and paralanguage. Face expressions are the intricate signals that are used for larger communication process. Eye contact is the important juncture of communication which provides the combination of ideas. Face expressions includes smile, sad, anger, disgust, surprise, and fear. A smile on human face appear happiness and it expresses eye with a curved shape line. Sad expression is the feeling of looseness and feeling of unhappiness which is normally expressed as rising skewed eyebrows and frown in face. Anger on human face is related to unpleasant and irritating conditions of mood. The expression of anger are

expressed with squeezed eyebrows, slender and stretched eyelids which gives the eyebrows v-shaped structure. Disgust feeling is expressed with pull down eyebrows and creased nose. Surprise expression is expressed when some unpredicted happens.

This is expressed with eye-widening and mouth gaping which makes a big rounded shape of mouth and this expression is an easily identified one. The expression of fear is related with surprise and anger expression which is expressed as growing skewed eyebrows. When these seven emotions are considered for research purpose then by conducting several tests in indicates that the suggested distance, angle and other geometric structures which are used for recognition gives

95.73% of accuracy. And when the six basic emotions out of seven are taken into consideration then the accuracy is 97.23%, which implies that the new published work for face emotion recognition are considered mostly.

Fig. 1.1 Facial Expressions

II. FACE EMOTION RECOGNITION TECHNIQUES

2.1 Preprocessing

Preprocessing is a procedure which can be utilized to improve the execution or effectiveness of the FER framework and it tends to be done before feature extraction process. Picture preprocessing incorporate various sorts of procedures as picture clearness and scaling, complexity and modification and extra upgrade forms as required to improve the articulation outlines.

The editing and scaling forms were performed on the face geographic picture in which the nose of the face is taken as midpoint and the other significant facial segments are incorporated physically. Bessel down testing is generally utilized for face picture size decrease yet it ensures the angles and furthermore the perceptual worth of the first picture Though Gaussian channel is utilized for resizing the info pictures which gives the smoothness touchy touch to the pictures. Standardization is one of the preprocessing technique which can be intended for decrease of enlightenment procedures and varieties of the face pictures with the middle channel and to accomplish an improved face feeling picture so we can perceive the feelings. The standardization technique is likewise utilized for the extraction of eye positions which make progressively hearty to character contrasts for the FER framework and it gives greater clearness to the information pictures.

Restriction is another sort of preprocessing strategy and it utilizes the Viola-Jones to identify the facial pictures from the given info picture. Discovery of area and size of the face pictures utilizing Adaboost learning calculation and haar like features. Restriction is essentially utilized for making sense of the size and area of the face from the picture. Face arrangement, another preprocessing step which can be performed and examine by utilizing the SIFT stream calculation. Here the, initial step is to compute reference picture for each face appearance. After that every one of the pictures of face are adjusted through related reference pictures. ROI(Region of Interest) division is one of the imperative sorts of preprocessing steps which incorporates three significant capacities and they are directing the face measurements by separating the shading parts of face picture, eye or brow and mouth locales division.

In FER, ROI division is most well known due to the helpful division of different face organs from the face pictures. The histogram adjustment strategy is utilized to vanquish the light varieties. This technique is for the most part utilized for upgrading the differentiation and brilliance of the face pictures and for precise lighting. Additionally used to improve the distinction between the forces. In FER, more preprocessing techniques are utilized however the ROI division process is increasingly reasonable on the grounds that it distinguishes the different face organs utilized for demeanor acknowledgment precisely.
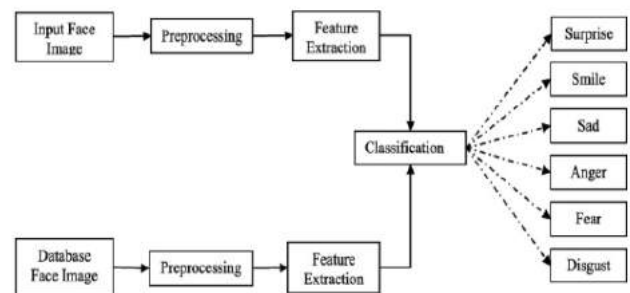
Fig. 2.1.1. Architecture of face expression recognition system.

2.2. Feature extraction

Feature extraction process is the following phase of FER framework. Feature extraction is utilized for find out and speak to the positive features of worry inside a picture for further preparing. This stage contains of two sub-arranges, the first is to gauge the geometrical features of the facial feelings. The paired picture is subdivided into N number of separated areas utilizing district developing strategy. By taking the power of characteristic face balance and common through and through and left-to correct request in which the feature show up in the human face, we discover rules to express the shape, size, surface and other qualification of facial features. In picture preparing PC vision include extraction is an astounding stage, where it detects the development from realistic to construed information portrayal. These information portrayal can likewise be utilized as an info information to the arrangement. The component extraction strategies are classified into five sorts as surface element based strategy, edge based technique, worldwide and nearby element based strategy, geometric element based strategy and fix based strategy.

The variation which extricate the features dependent on the surface component based strategies are portrayed as pursues. Gabor channel is a surface portrayal strategy for feature extraction and it is likewise includes the extent and crossroads data. The Gabor channel in which the size element are implanted fundamentally detain the data about the association of the face picture. The point include areas the data about the entire portrayal of the size features. Nearby Binary Pattern is additionally characterize surface descriptor and it very well may be utilized for feature extraction technique. For the most part LBP features are created with the twofold code. which can be extricated by utilizing thresholding between the middle pixel and its territory pixels .

Likewise LBP with Three Orthogonal Planes features are removed for multi goals approaches in picture preparing techniques. It is additionally utilized for removing non dynamic appearance. Furthermore, these non dynamic appearances dependent on features from the static face pictures. The facial surface features are removed and refined utilizing the Gaussian Laguerre work. These capacities which concedes a guiding pyramidal structure that concentrates the surface features and furthermore the facial related existing information.

In Comparison to Gabor work GL utilizes the single channel rather than numerous channels There is one more element extraction process, Vertical Time Backward (VTB) that are utilized to removes the surface features of face pictures. Minutes descriptor separates features of huge outward appearances which are formed based for the most part. Both VTB and minutes descriptors are substantially more gainful on spatiotemporal planes Weber Local Descriptor (WLD) is one of the element extraction method that gets the excellent surface features from the portioned face pictures.

From the outset, the facial principle positions are removed. Next the related positions are chosen as nose, eyes, eyebrows, and so forth. At last the separation between different parts of face are removed. Weighted Projection based LBP (WPLBP) is additionally an element extraction strategy dependent on the instructional districts which extricates the LBP features. After that dependent on the uncommon of the informative districts these features are weighted.

The descriptors which remove the features dependent on the edge based strategies are depicted quickly as pursues. Line Edge Map (LEM) descriptor utilizes the dynamic two strip calculation as an outward appearance descriptor which improves the geometrical structural. Two sorts of facial features which dependent on movement investigation are removed utilizing non discriminative and

discriminative. Illustrations preparing unit based Active Shape Model is additionally one of the element extraction strategy which can be performed with edge discovery, improvement, tone mapping and nearby appearance model coordinating. The picture proportion features are separated from the communicated face pictures after that procedure. Histogram of Oriented Gradients is known as window bolstered include descriptor which utilizes the inclination channel strategy. The separated features are primarily founded on the edge data which are gotten from the enrolled face pictures and structures.

The descriptors which separate the features dependent on the worldwide and nearby element based techniques are depicted as pursues. Head Component Analysis strategy is utilized for feature extraction. It removes the worldwide and low dimensional features from the facial structure gave. Free Component Analysis is an extraction technique which removes the nearby features utilizing the multichannel perceptions. Stepwise Linear Discriminant Analysis(SWLDA) is a component extraction system which separates the restricted features with the assistance of both in reverse and forward relapse models.

The descriptors which extricate the features dependent on the geometric element based strategies are given as pursues. Nearby Curvelet Transform is a component descriptor which removes the geometric features of an outward appearance which for the most part relies upon wrapping instrument. The geometric features that are removed as mean, entropy and standard deviation. Notwithstanding these geometrical features, vitality and kurtosis are extricated by utilizing three phase of steerable pyramid portrayal.

These descriptors extricate the features dependent on patchbased techniques. Facial development features are removed as patches which relies on the separation qualities of the face pictures. These are

performed by utilizing two procedures, for example, extricating the patches and fix coordinating. The fix coordinating is for the most part executed by making an interpretation of extricated patches into separation attributes. The surface element based descriptors are more helpful element extraction strategy than others as it removes the surface features in connection with the appearance and surface which gives the significant component vectors to FER.

2.3. Classification

classification is the last phase of FER framework in which the classifier order every one of the articulations, for example, grin, miserable, shock, outrage, dread, sicken and impartial. The coordinated Line section Hausdorff Distance (dLHD) technique is commonly utilized for acknowledgments of articulations. Euclidean separation metric is likewise for the most part utilized for arrangements purposes which utilizes the standardized score and comparability score framework for evaluating Euclidean separation. Least Distance Classifier(MDC) is likewise known one of the separation based classifier is utilized for the arrangement which is required gauges the separation between the element vectors each sub picture. Bolster Vector Machine (SVM) is one of the characterization systems in which two sorts of approaches are incorporated. They are one against one and one against all methodologies. SVM is the directed AI strategy which utilizes four sorts of parts for its better execution. The Hidden Markov Model (HMM) classifier is the measurable model which orders the articulations into various kinds.. Shrouded Conditional Random Fields (HCRF) portrayal is utilized for required arrangement. It utilizes the full covariance Gaussian dissemination forunrivaled grouping execution. Online Sequential Extreme Learning Machine (OSELM) is one of the strategy that utilizations RBF for arrangement. OSELM for the most part contains two phases. They are introduction and consecutive learning stages.

The CNN additionally contains two significant observations likely shared weight and meager availability. In FER, the CNN classifier utilized as numerous classifiers for the diverse face locales. In the event that CNN is encircled for whole face picture, at that point first casing the CNN for mouth territory and next for eye region likely for one another zone CNNs are confined .Deep Neural Network (DNN) contains different shrouded layers and the more troublesome capacities are prepared effectively contrasting and other neural systems. The Deep Belief Network (DBN) contains the different concealed variable lives of the different number of Restricted Boltzmann Machine (RBM) which are the undirected generative example .

DBN for the most part incorporates two stages, for example, pre-learning and calibrating in which classifiers SVM classifier gives productive acknowledgment RBM are grown independently in the initial step while the BP are learning the info and yield information in the last stage.

As per a few precision and it gives better classification. The neural system based classifier CNN gives preferable exactness over the other neural system based classifiers. In FER, SVM classifier is progressively exploitable contrasting and different classifiers for acknowledgment of articulation.

III. CONCLUSION

The significant future upgrades depicted from late papers are FER for side view faces utilizing the emotional data of facial sub-districts and utilize different parameters to speak to the diverse posture of the face for continuous applications. FER is utilized progressively applications, for example, driver satiate observation, therapeutic, mechanical technology association, scientific area and recognizing duplicities.

This review analyzes calculations dependent on preprocessing, include extraction, grouping and significant commitments. This paper talks about the different properties, for example, accessibility of preprocessing and feature extraction and articulation tally. return for capital invested division strategy is utilized for preprocessing and it gives the most noteworthy exactness 99%. The most noteworthy acknowledgment precision of 99% is given by the SVM classifier and it perceives the few articulations, for example, nauseate, tragic, grin, shock, outrage, dread, impartial successfully.

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Synthesis and Structural Characterization of Mg2SiO4 Nano Particles

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ABSTRACT

Mg2SiO4nanomaterial was synthesized using combustion method with metal nitrate as precursor and ODH as fuel. The powder X-ray diffraction (PXRD) patterns of the as-formed products show single orthorhombic phase and no further calcination was required. The crystallite size was obtained using Scherer's formula and was found to be 25-30 nm.

Keywords : Combustion, Characterisation

I. INTRODUCTION

Nanotechnology has pulled in a few investigates from the luminescence field. Nanophosphors contrast from existing bulk materials as far as its electrical and optical attributes because of quantum size effect and this impact is brought about by an expansion in the band gap because of a reduction in the quantum permitted express that exists in little particles and the high surface to volume proportion which improves the surface and interface impacts.Silicate family is an appealing class of materials among inorganic phosphors for wide scope of uses because of their unique properties, for example, water, compound obstruction and unmistakable light straightforwardness. In silicate family, the Mg2SiO4 have material called as Forsterite when doped with uncommon earth particles shows some fascinating applications, for example, durable phosphors, X-beam imaging, shows (LED), ecological observing, unadulterated shading outflow and so forth.Forsterite (Mg2SiO4) crystalline nanophosphor belongs to olivine family of crystals with orthorhombic crystalline structure in which Mg2+ occupies two non equivalent octahedral sites : one (M1) with inversion symmetry (CI) and the other (M2) with mirror symmetry(CS). Synthesis of silicate phosphors can be done in different methods such as solid state reactions, sol-gel, hydrothermal, precipitation, combustion synthesis, etc. Among all methods low temperature combustion synthesis (LCS) route is the best suitable technique because it gives high degree of homogeneity, short reaction time that leads to reduction in crystallization temperature and prevents from segregation during heating [1-3]. Eu3+ doped phosphors can be adequately energized by N-UV and blue light, and make a solid red emanation which credits to 4f–5d advances which include wide ghostly line width as happened for low valence uncommon earth particles are gem field related and can be tuned by the size and the precious stone structure [4-6]. In this paper we report on low temperature amalgamation, basic portrayal of Mg2SiO4.

II. EXPERIMENTAL

The fuel oxalyl dihydrazide (ODH) (C2H6N4O2) was set up in our research center by the response of diethyloxalate with hydrazine hydrate [7-8] as depicted in the writing. Watery arrangement containing stoichiometric measures of analar grade magnesium nitrate, seethed silica and research facility arranged ODH are taken in a Petri dish of 300 ml limit. The arrangement were mixed well utilizing attractive stirrer and afterward the petridish is brought into a stifle heater kept up at low temperature i.e 350±10 ◦C. The ignition happens all through the response blend with the freedom of oxides of nitrogen and carbon inside a brief timeframe of ˜5 min.

III. RESULTS AND DISCUSSION

The PXRD patterns of the as-formed combustion derived Mg2SiO4 sample was shown in Fig 1. The pattern is well matched with the JCPDS card number 78-1372. The crystallite size (D) of Mg2SiO4 sample was calculated using Debye- Scherer's formula and W-H plot [9]. The crystallite size is found to be ˜25 nm.
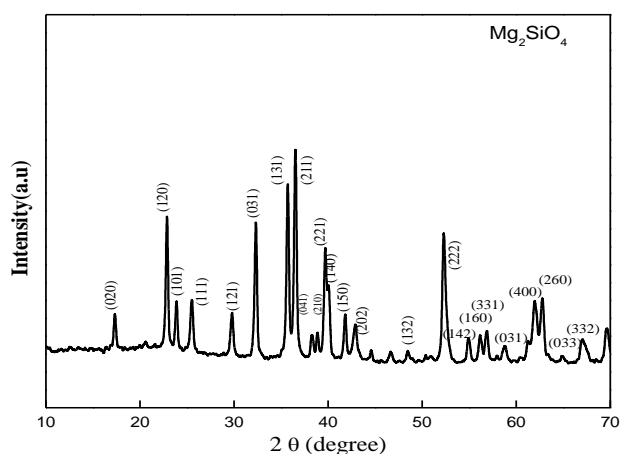
Fig. 1. PXRD pattern of Mg2SiO4.
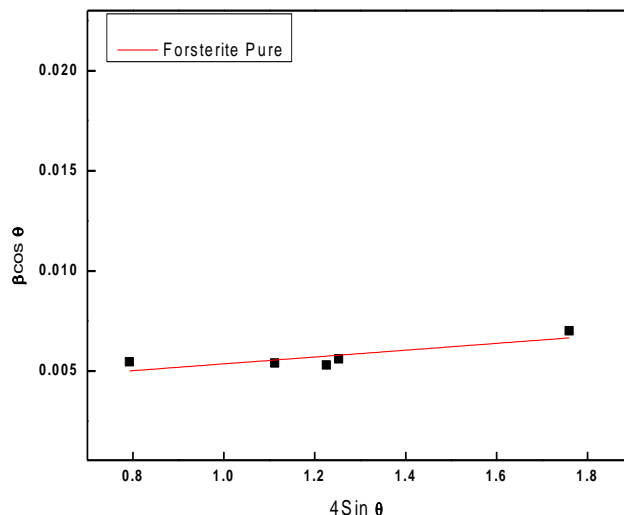
Fig. 2. W-H Plot of Mg2SiO4.

The room temperature infrared spectra of Mg2SiO4sample is recorded in the range 300–4000 cm–1 utilizing KBr pellets is appeared in fig 3.The peaks at 420, 525, 620, 680, 880, 1020, 1250 and 1384 cm–1 are alloted to MgO6 octahedral, Si–O, Si–O (twisting), Mg–O, Si–O (extending), (CO and Si–O), C–H and NO3 separately [11].
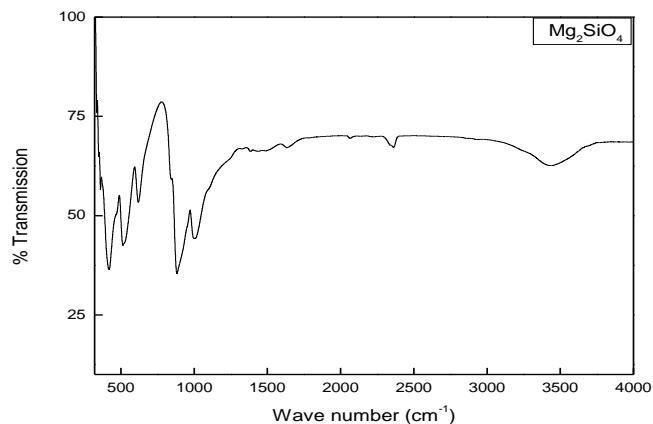
Fig. 3. FTIR of Mg2SiO4

IV. CONCLUSION

Mg2SiO4 nanoparticles are prepared using solution combustion method with a crystallite size 25-50 nm. FTIR spectrum confirmed stretching and bending modes of the sample.

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Microcontroller Based Talking Energy Meter

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ABSTRACT

In current years, the electricity demand has augmented in households with the usage of different appliances. This increases a worry to many developed and developing nations with the demand in instant rise of electricity. Consumers are unconscious of energy used up by various appliances. The total amount of energy used up by various appliances is calculated by an electricity meter device. The major disadvantage of earlier old-style electricity meters are they do not give information to the consumers about how much energy is consumed. To overcome this a novel electricity meter called talking energy meter is accomplished. As consumption of the power is raising day by day there should be more attention on understanding consumption patterns. Outmoded electromechanical energy meters are now substituted by electronic meters in all types of applications such as domestic and commercial applications. In this paper, aims to design a circuit which helps the consumer in taking care of the electrical energy consumption. This system helps the users by notifying them about the billing status and unit consumption.

Keywords : Energy Meter, Microcontroller, Electricity, Arduino, Embedded C, GSM.

I. INTRODUCTION

The traditional energy meters are used in household technology in olden days to measure the amount of power consumed. These energy meters play a important role in measuring the power consumption of electrical energy in distinct households. With the advancement in technology, the usage of these energy meters has been decreased slowly. The major disadvantage of these meters are people are not aware how much energy is consumed on daily basis. The energy consumed will be generated on monthly basis which is not sufficient as the consumer will not have any knowledge on how much energy does the individual appliances consume. To overcome the problems of traditional electricity meters, electronic meter or static energy meter comes in picture. Technology is increasing very exponentially in these days. Together with electricity distribution, in all other fields also highly automatic and secured systems are preferably chosen. Electrical energy is commonly considered as an most important commodity for all living beings. Energy is the major agent of economic growth and is important to the wherewithal of modern economy. The economic growth of the future is mostly depends upon the availability of energy from its sources for long term.

Micro-controller based "Talking Energy Meter" mainly objects at the two classes (middle and lower) family to bring down the electricity bill with the help of the power consumption alert system. It benefits the government as it is helps in reducing the power consumption and thereby can reduce the unusual power usage. Energy meters being deployed at homes are used for reading the power that is being consumed. Each consumer may fix a customized threshold value (unit). If the value reaches above the threshold, it will alert to the consumer by voice module. This system may install at any place where the energy consumption should be regularly monitored and controlled. The consumers can fix their own threshold budget values and can be easily customized based on their requirements. The main use of this is to continuously check the reading of the energy meter and give the information of number of units spent along with the cost to the consumer. It also alerts the user if someone tries to steal the electricity from meter by using IR sensor and cut the line and inform the Electricity Board by mobile application.

The most important components used in this system are Micro-controller ATMEGA 328, Energy Meter, GSM module, Voice Module aPR33A3, IR Sensor. Micro-controller is the central unit of this system and is connected to GSM module, Voice Module aPR33A3 and energy meter is connected through various ports.

Micro-controller drives the voice module to play the voice messages based on the energy meter readings. The typical voice alerts are like "threshold limit is reached", "pay electricity bill" etc. The LCD display in this system displays continuously the real time energy meter readings. This can be done by the use of micro-controller ATMEGA 328 unit that is used to record and monitor the readings of energy usage in its memory. The micro-controller that we use in our project is ATMEGA 328.

II. TALKING ENERGY METER

The main purpose is to design a talking energy meter circuit which will provide information to the consumer about their usage of energy by giving the voice alert when consumed energy set by the user exceeds the threshold limit which is set according to their requirement. It also has many advantages such as helps to monitor the electrical energy usage and protect the meter if someone tries to theft the electricity by cutting the line of meter with prior SMS to the electricity board.

An AC source is given to the electric energy meter and from this; the load is connected to the meter via a relay switch. The fourth LED of the energy meter is given to one of the digital pins of microcontroller ATMEGA 328 at port C. The microcontroller is connected to the voice module and the GSM module. The main function of the GSM unit is to send and receive messages through a mobile network to give daily alerts.

The energy values once taken from the energy meter are digitized and processed with the help of a microcontroller ATMEGA 328. The billing of the corresponding energy usage is determined and per unit rate of consumption is set at the time of programming. The threshold unit value is set for which the consumption level increase is notified to the user. And the user can change that threshold limit according to the requirement by using dome switch.

A relay switch is connected with the microcontroller and the load which is used to cut the supply if someone tries to steal the electricity. It is used as protection purpose. Voice Module is used to give the alert when consumption of units exceeds the set limit by user. As soon as the limit exceeds, the voice alert occur and SMS get send on registered mobile number.

The drawbacks of Existing System are 1) The electricity consumption is calculated or done on every month basis by the human operator by going from one place to another where human errors will occur and cause wrong readings and wrong billings too. It also takes more time in collecting the data and requires more man power. 2) One more disadvantage is no monitoring of usage of Electricity, because of this consumers are not aware of how much usage of electricity is done and not aware of daily usage as well.3) No Provision for energy stealing in previous meter, if energy gets theft by the other people, owner not gets information about the stealing of their energy meter. And owner get suffer from this. In this proposed system, all the disadvantages of existing system are overcome. Talking Energy Meter based on microcontroller is design to give voice alert and monitor the energy usage. Voice can be in any language so that it easy to understand for common people. It is more convenient to physically disabled people.

III. BLOCK DIAGRAM AND FLOW CHART
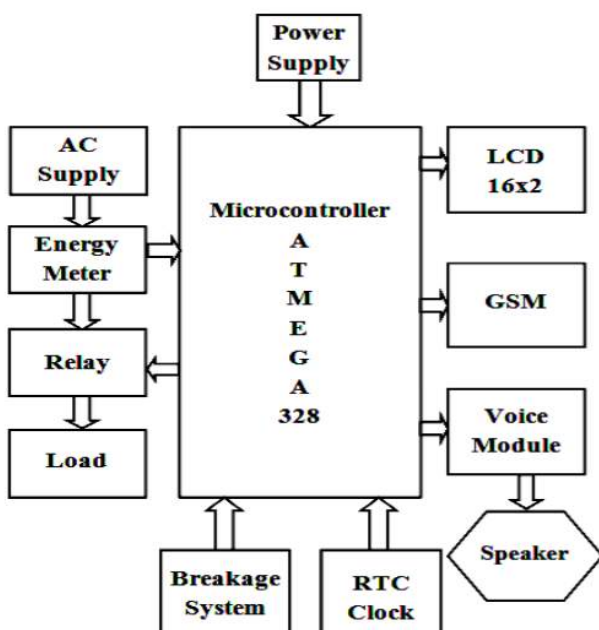
Figure 1: Block diagram of Talking Energy Meter

The hardware requirements are Arduino, Energy meter, LDR, GSM, LED, current sensor. The software are Arduino IDE and Embedded C programming.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino is open-source hardware. An early Arduino board has a serial interface of RS-232 and a microcontroller chip of ATmega8 by Atmel. The board also contains 14 digital Input /Output pins are at the top, the 6 analog input pins at the lower right, and the power connector at the lower left.

An Arduino board consists of different bit Atmel AVR microcontroller such 8-bit, 16-bit or 32-bit (although since 2015 other makers' microcontrollers have been used) with other supporting components that enable programming and integration into other different circuits. One of the important feature of Arduino is, it has typical connectors which allows the user to connect the CPU board to a diversity of substitutable add-on modules known as shields. Some of these shields directly make a connection with the Arduino board through various pins. But many shields are addressed individually using a I²C serial bus, because of this shields can be stacked and can be used in parallel. Previously, Arduino boards had used the series of Atmel Mega AVR chips. Mostly used chip series are ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560.In the year 2015, different units are added by other producers. We can make use of the board to perform different functions such as reading inputs, glowing of LEDs, rotating the motor etc by sending a set of instructions(program) to the microcontroller on the board. Depending upon the processing, we use the programming language of Arduino which is based on wiring and Software IDE.

The Atmel ATmega328/P is a CMOS 8-bit microcontroller which consumes less power. The architecture is enhanced Reduced Instruction set Computing (RISC). The ATmega328/P attains throughputs near to 1 MIPS per MHz by executing powerful instructions in only one clock cycle. This authorizes the designer to have a trade-off between processing speed and amount of power consumed.

The European Telecommunications Standards Institute (ETSI) has developed a typical set called GSM (Global System for Mobile Communications), to define protocols for second generation digital cellular networks used by mobile phones. It is an advanced one which replaces first generation (1G) analog cellular networks. It is described as digital, circuit switched network optimized for full duplex voice telephony. This was extended from time to time, and includes many things such as data communications, then by circuit switched transport via GPRS (General Packet Radio Services), EDGE (Enhanced Data rates for GSM Evolution or EGPRS).

In a cellular system, the operator covering area is divided into cells. A cell consists of one transmitter or less number of transmitters. The amount of power gives the information about the size of a cell.

The main idea of cellular system is to use low power transmitters such that the frequencies have an effective reuse. In fact, if the transmitters used are very powerful, the frequencies cannot be reused for hundreds of kilometers as they are limited to the covering area of the transmitter. The frequency band allocated to a cellular mobile radio system is distributed over a group of cells and this distribution is repeated in all the covering area of an operator. The whole number of radio channels available can then be used in each group of cells that form the covering area of an operator. Frequencies used in a cell will be reused several cells away. The distance between the cells using the same frequency must be sufficient to avoid interference. The frequency reuse will increase considerably the capacity in number of users.

In order to work properly, a cellular system must verify the following two main conditions: 1) The power level of a transmitter within a single cell must be limited in order to reduce the interference with the transmitters of neighboring cells. The interference will not produce any damage to the system if a distance of about 2.5 to 3 times the

diameter of a cell is reserved between transmitters. The receiver filters must also be very performant. 2) Neighboring cells can not share the same channels. In order to reduce the interference, the frequencies must be reused only within a certain pattern

The general purpose photoconductive cell is also known as LDR – light dependent resistor. It is a type of semiconductor and its conductivity changes with proportional change in the intensity of light. The complete principle of an LDR is as follows. In a semiconductor an energy gap exists between conduction electrons and valence electrons. As an LDR is also known as semiconductor photoconductive transducer, when light is incident on it, a photon is absorbed and thereby it excites an electron from valence band into conduction band. Due to such new electrons coming up in conduction band area, the electrical resistance of the device decreases. Thus the LDR or photoconductive transducer has the resistance which is the inverse function of radiation intensity.

ESP8266 gives a full and self-sufficient Wi-fi networking solution, permitting it to host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements.

The designed energy meter includes a simple energy meter, a GSM modem, an Arduino, web portal. The energy meter blinks the LED light and the LDR connected to the Arduino counts the number of times the LED blinks and this count is send to user by SMS and also displayed on the web page.

The users can be aware of their electricity consumption. The human work of collecting

readings by going to every home at the end of every month can be avoided by generating electricity bills automatically. Theft of electricity can be avoided by tamper proof energy meters. The errors in the system can be recognized quickly.

The advantages of the proposed system are Voice based alerts, Efficient and low cost design, User friendly, Low power consumption, Energy readings are stored in non-volatile memory. The disadvantages is that it is delicate to interface microcontroller with energy meter. The important applications of this system is that it can be practically implemented in real time where there is a limitation on energy utilization.

Figure 2: Flow chart of Talking Energy Meter

IV. RESULTS AND DISCUSSION

The Microcontroller based Talking Energy Meter mainly aims at the middle class and the lower class family to bring their electricity bill down with the help of the power consumption alert system. It benefits the government as it helps in reducing the power consumption and can reduce the unusual power usage. The snapshot of LCD display is shown below.

The GSM output format has been analyzed. The Arduino operations were studied and it is programmed and the system working model was developed in order to accomplish the objective. The IOT based energy meter saves the customer's time by making them work "leaner". The operation of the calculating the power cost is simple and doesn't involve delays. The power cost is sent through serial communication to the user through GSM.

V. CONCLUSION

The project is mainly intended to get a voice alert if usage goes beyond a set value. This system used a voice module into which a predefined alert voice messages are stored. It sends the SMS to user of billing status and when preset limit is exceeded.

FUTURE SCOPE

The size of this project can be reduced by use of advanced processor. The extra features to detect the faulty condition like over voltage, over current, earthing fault, etc. can be included in the design of talking energy meter to improvise.

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UWA Channel for Data Communication of UWASN using OFDM

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ABSTRACT

In this paper, the Underwater Acoustic Channel modeling and its estimation for successful data communication between the underwater nodes is presented, since the underwater wireless communication is a rapidly growing area of research and engineering. For designing the underwater sensor network, underwater channel is required for efficient communication. The acoustic channel used for propagating the underwater data from transmitter to receiver, in place of RF signal because RF signal attenuates under the water and Optical signal can be used for long distance communication. Therefore; the acoustic signals are used for data transmission. This channel is having formidable challenges like slow transmission of data, prescribed bandwidth, varying transmission delay and many more, which gives multipath fading and Doppler Effect. In this paper, we present the estimation and modeling of efficient underwater acoustic channel for data communication. The channel is modeled based on designed algorithm for noise interference, transmission losses, multipath fading effect, Doppler Effect, transmission delay and bandwidth limitation. Acoustic signal scattered and propagates very slow under the water, due to which data may get scattered and lost. These issues are solved using OFDM approach. As the signal gets scattered in to the water, therefore orthogonal frequency division multiplexing technique is implemented, which divide the carriers into equivalent sub-carriers. Here 16 to 64 sub-carriers at the frequency of 3.6 MHz and each sub-carrier are made to process 256 bits per sub-channel; therefore, maximum 4096 bps to 16384 bps can be actually transmitted with the help of each sub-carrier. Based on this concept, the system is simulated for 25 numbers of nodes. Here, we design the acoustic channel is particularly modeled based on Gaussian distribution, where the delay varies with time rapidly. The Orthogonal Frequency Division Multiplexing technique, which is used to overcome the problem of scattering by using the method called maximum entropy modeling method. In this method, the delay between transmitting signal and received signal has been calculated referred as Doppler Spread. It also calculates the bit transmitted rate and bit error rate by diving the channel in to sub-channels using OFDM. Because acoustic signal when travel under the water it get scattered in almost all direction due to which fading problem increases also it increases the issues of Doppler spread, Doppler shift, Doppler delay, etc. In this work, the system design and its simulation results are shown, the underwater acoustic communication channel is model using Maximum Entropy modeling technique for Acoustic channel simulation with its root mean square. Doppler spread is calculated as 0.5 to 2 Hz. The Acoustic communication channel satisfy smart antenna approach by using IEEE standard 802.15.4 which gives the data transmission rate up to 250 Kbps at 2.4 GHz carrier frequency for at least 2m vertical communication link and

approximately 2m horizontal link by keeping the depth of water up to 1m, since shallow water acoustic communication is consider. For this, the bandwidth was kept up to 2.4 GHz. The system can generate the maximum signal-to-noise ratio (SNR) is up to 1.477 dB and its Signal-Error-Rate (SER) is calculated as -14.9513 dB. The system is tested for all atmospheric condition under different environment. The proposed system is designed and tested for shallow water using two tested nodes. The low cost sensor nodes are designed which can continuously read the data like temperature, pressure and salinity below the water and it can then be transmitted to the receiver which is also kept under the water. The receiver receives the data and displays it on Laptop continuously. This process demonstrates the vertical and horizontal communication.

Keywords : Underwater Sensor Network, Wireless Communication, Orthogonal Frequency Division Multiplexing, Acoustic Channel, Channel Estimation.

I. INTRODUCTION

Wireless Data Transmission in Underwater Sensor Network is the Challenging job for the researcher. Lot of research is being carried out in this upcoming field. Estimation of proper data transmission channel is required, since the data get lost under the water due to attenuation and data get scattered under the water due to its multi path fading effect. To reduce these problems, the transmission channel is model in this paper using OFDM system used for Underwater Acoustic Sensor Network (UWASN). In this model, the data get transmitted using multiple orthogonal subcarrier, through which various bit stream get transmitted using lower data rate. The orthogonality can be achieved by placing the sub-carriers at the multiple of 1/T, where T is the OFDM Time period. Due to this the data rate of each of the sub-carriers gets reduced than the total data transmission rate, which also reduce the bandwidth of the corresponding sub-carriers. By reducing the sub-carrier bandwidth, the multi path fading effect is also reduces and relatively flat fading effect can be considered. In this paper, the channel estimation can be achieved based on the OFDM technique, where the channels are separated into number of sub-carriers based on their data carriers, guard carriers and pilot carriers for OFDM system. In this system, the data sub-carriers are 100, guard sub-carriers are

10 and pilot sub-carriers are 12. With the help of these parameters, the orthogonal sub-carriers are estimated and mapped for designed transmitter and receiver. The designed OFDM system is totally based on the ECMA International Standards; Data bit are convolution encoded for generating coded bits for OFDM system. This OFDM System is modeled using MATLAB for generating coded bits for UWASN transmission. In this proposed system, the underwater Acoustic Communication channel is model using maximum entropy modeling technique with its root mean square. Doppler spread is 0.5 - 2 Hz only. Here, the acoustic channel satisfy the smart antenna approach by using IEEE standard 802.15.4, which gives the data transmission rate up to 250 Kbps at 2.4 GHz carrier frequency for at least 2m vertical link and approximately 100 m horizontal link, by keeping the depth of water up to 1.5m. The system is tested in a 25m x 13m (i.e. 325 m2) swimming pool with 1m to 1.5m depth. Therefore, the acoustic channel is also estimated based on shallow water conditions. Since shallow water acoustic communication is consider. For this the bandwidth was kept up to 2.4GHz. This can generate the maximum signal-to-noise ratio (SNR) is up to 1.477 dB and its Bit Error-Rate (BER) is calculated as -14.9513 dB. As the signal gets scattered in to the water, therefore orthogonal frequency division multiplexing technique is implemented, which

divide the carriers into equivalent sub-carriers. Here 16 to 64 sub-carriers at the frequency of 3.6 MHz are used and each sub-carrier are made to process 256 bits per sub-channel, therefore, maximum 4096 bps to 16384 bps can be actually transmitted with the help of sub-carriers. Based on this concept, the system is simulated for 20 numbers of nodes then, for simulating this network the maximum energy required is 0.4094 Joules. Based on above tested and simulated results, here we designed the smart underwater acoustic communication system with fast communication and less power consumption.

II. OFDM MODEL FOR UWASN

The OFDM System generate the input bit pattern using Scramble function in MATLAB, which generate the one particular initial value out of various random values using generator polynomial which gives initial values with the help of LFSR which identifies one value among the four initial values using LFSR. Number of bits to generate for scrambling function must be equal to the number of bits in the input. This can be achieve using bitwise XORing between input bits and generated pseudo-random bits to get the scrambled output bits. This scrambled function now generates the coded bits for the OFDM system. The symbol intervals bits is done by grouping the coded bits into blocks of 6 X 'bits Per Symbol' and then permuting it, which interleaves the coded bits into 6 OFDM symbols. The system generate the interleaves bits using cyclic convolution shift of the coded bits, number of bits gets shifted and the bits per symbols. This process will create the permuted matrix for interleaving symbols. This cyclic shifting should be done for OFDM block by block for all the coded bits or input bits. The figure 2.1, shows the coded bits generation pattern for regular interval from pseudo random bits. This coded bits or input bits then transmitted through the designed trans-receiver and from there to the base station using proper channel. The channel was already estimated and was explained in [1].
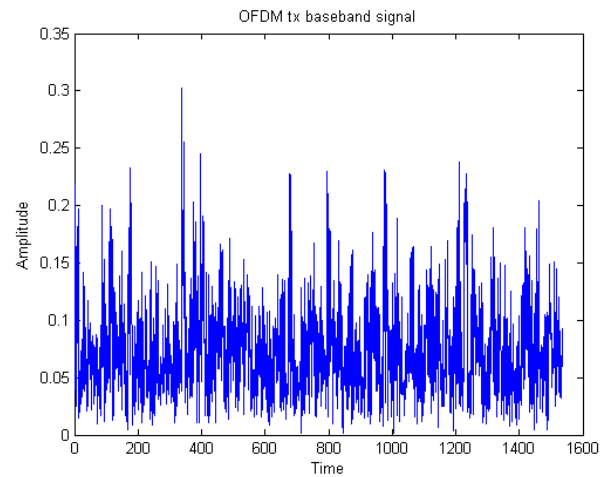
Figure. 2.1. Coded bits generation

III. UNDERWATER ACOUSTIC CHANNEL ESTIMATION

Taking into account the physical models of acoustic propagation loss and ambient noise, the optimal frequency allocation for communication signals can be calculated. Considering optimal signal energy allocation, such frequency band is defined so that the channel capacity is maximized [5]. The results that are assessed suggest that, despite the fact that frequency spectrum [6][8] for underwater acoustic communications, the possibilities in terms of usable frequency bands are not numerous, due to acoustic path propagation and noise characteristics.

A. SNR and SER

The narrow-band signal to noise ratio (SNR) observed at a receiver over a distance L m when the transmitted signal is a tone of frequency f and power P is given by:

$$SNR(l, f) = \frac{\frac{P(F)}{A(L, F)}}{Nf\Delta f}$$

where f is a narrow band around the frequency f, and S(f) is the power spectral density of the transmitted communication signal. Directivity indices and losses other than the path loss are not counted. The AN product, A(l,f)N(f), determines the frequency-dependent part of the SNR. The inverse of the AN product is illustrated in Figure 2.2.
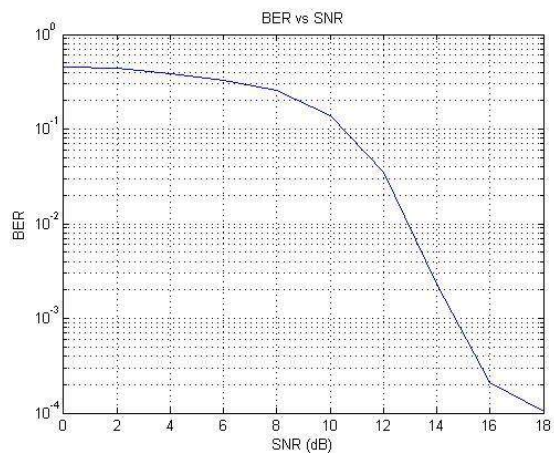
Figure 2.2 Simulation results of SNR with BER

Figure 2.3 Simulation results of Transmission Power with Power Consumption

B. CHANNEL ESTIMATION

Xbee systems are based on the IEEE 802.15.4 standard. The physical interface is based on OFDMA, which is a multiuser multicarrier modulation technique, in which the different sub-carriers of each symbol may be shared between several users. The bandwidth can be scaled from 1.1 MHz (corresponding to 64 sub-carriers) to 3.6 GHz (corresponding to 64 subcarriers), leading to significant flexibility in system design. The bandwidth of each sub-carrier is 25.6 MHz in all configurations leading to a constant OFDM symbol duration of 3.2 μs, not including the cyclic prefix. Several coding and modulation schemes are contained in the standard.

There are seven mandatory schemes including modulations from QPSK to 64 QAM and convolution coding with rates 1/2, 2/3 and 3/4. The spectral efficiency can then be varied from one information bit per symbol to 4.5 information bits per symbol and hence enabling systems to adapt to varying received SNRs.

Multiple antenna techniques further enhance the performance of the technology. There are mainly two MIMO techniques included in the standard. In order to estimate the underwater acoustic channel using OFDM approach. The channel is sub-divided into 64 sub-carriers through which the data can be transmitted with 25.6MHz bandwidth of each sub-

carrier. Each sub-carrier is having is used to transmit 256 bits at a time. The OFDM symbol duration is 3.2μs and it generate the Doppler spread up to 0.5-2Hz with delay spread is 1ms. The proper guard intervals are inserted to avoid the Interference in between the sub-carriers as shown in figure 6.5. The underwater system performance can be tested based on the three different algorithms, like Rayleigh fading channel, MSE of the channel estimator and BER performance.

IV. DENSITY OF WATER

Every sea water is having two major parameters: Temperature and Salinity (the concentration of dissolved salts), because the decomposition of seawater is brought due to volcanic eruption, erosion of rocks, various acids and alkaline decomposition, available minerals in the seawater, etc. The density of seawater ranges from 1020 to 1030 kg/m3 while the density of freshwater is about 1000 kg/m3 [3]. The density of seawater is depending parameter on salinity and temperature, as the temperature increases density of water decrease whereas density increases with increased values of salinity. Generally, oceanic water having 1025 kg/m3 density. Density of seawater can be calculated by using many methods out of that here coppen's formula is used for calculating the density of sea water. This parameters are tested using Matlab code for shallow water where the temperature of the water was kept constant at 320 and salinity is calculated in the laboratory using

chemical solution. Since the density was calculated for the shallow water in the water tank therefore; the depth of water was not more than 6' approximately 1.8288 meters. Therefore; the calculated value of density of shallow water is shown in the figure 3.1. This shows that the shallow water is denser, due to its cross-sectional area.
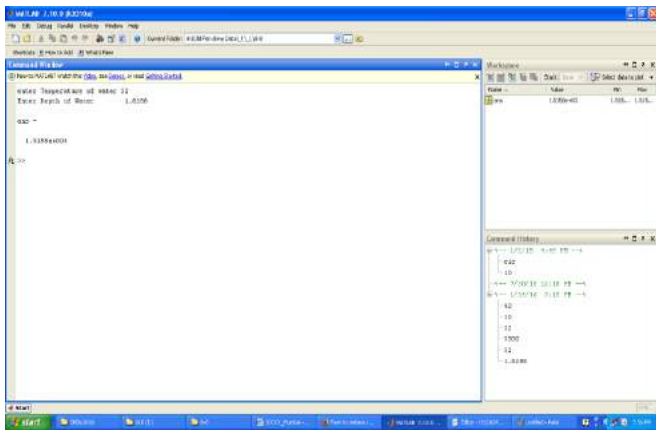
Figure. 3.1 Calculation of Shallow water Density using

V. IMPLEMENTATION OF THE UWASN ON THE REAL TIME ATMOSPHERE

The hardware implementation of Underwater Acoustic Sensor Network is a complication process. The proposed system is implementing and partially tested based on the real time environment. The shallow water scenario is initially considering for the testing purpose and further the system can be tested into the real oceanic environment. The equipment required for measuring the parameters like temperature, pressure and salinity of the oceanic water at the real time environment is bit difficult and also cost effective issue, therefore, it has been kept it for the further studies. The designed system used different sensors like temperature sensor, pressure sensor and sensor for salinity of water, which has been designed using microcontroller. The designed system is tested in shallow water for temperature and salinity can be calculated based on the calibration of chemical formula using laboratory experiment, where the hardness of the water was calculated using titration and alkalinity method, here three different water sample was consider,

standardization of HCL was performed on that water sample and then the titration were carried out for alkalinity. Based the given result the salinity of the water samples were calibrated in the laboratory in the presence of some expert faculty of chemistry. The pressure is calibrated using load cell. Here the load cell is used as the pressure sensor for reducing the cost of the system. This load cell can bare the pressure of water up to 40Kg in terms of load. Initially, the calibration of the pressure was done in a water tub further it can be tested in the water tank where the volume of water can vary, which increases it pressure, the load cell can consider the pressure in both the direction that is upward direction and backward direction. Since the volume of water is less in water tub; therefore the backward pressure was more, which gives negative resultant pressure. To overcome this problem, the load cell is covered with iron plate placed 3mm below the load cell, which reduced the effect of negative pressure value. This arrangement is made for temporary. Once the system will be tested in the large volume area at that time the actual pressure (upward pressure and backward pressure) both can be consider. All these parameters can read by the various nodes place under the water and transmit this value to either another node as well as the base station continuously. The system is designed is such a way, that the continuous data transmission should be carried out for transmitter to the base-station's receiver. Here in this proposed system two trans-receivers are designed which continuously read the values under the water and transmitted to the base-station. The system is also measure the temperature. The various damages occurred while testing the system under the water which were tried to overcome time-to-time using different techniques and methods like water leakage inside the circuit due to which the complete circuit gets damage, which then gets seal using permanent sealing solution. The circuit provides some weight by designing a heavy metallic box otherwise the circuit box was floating on the water. Here two such boxes were designed for two trans-receivers.

VI. SIMULATION RESULTS

In this paper, an algorithm is presented for estimating the standard deviation of some AWGN when observations derive from signals less present than absent in this background. According to experimental results, this algorithm is very promising. An application of two sensor nodes have been designed and tested on free air environment and under acoustic /aquatic environment for transmitting the data from transmitter to receiver. Using this MC-ESE algorithm, the efficient energy consumption is calculated and its simulating results are shown using MATLAB coding results as per the table given in Table 1.

Table 1:

Existing Algorithm		Proposed Algorithm	
Distance Travels by Nodes (m)	Energy Consumption (J)	Distance Travels by Nodes (m)	Energy Consumption (J)
20	0.15	10-20	0.2962
40	0.35	21-30	0.3471
78	0.39	31-45	0.275
100	0.72	**46-100**	**0.3459**

The energy efficiency can also be calculated using Greedy algorithm; these algorithms rely on the connectivity matrix. In short, a logical matrix where true represents a connection and the connections are determined by the distance between nodes and the range of the active modem. When a node receives a radio message it will use the connectivity matrix to determine it's furthest connected neighbor, the performance of the model implementing this algorithm is summarized in Table 2.

Therefore it is very much clear from the table shown above that, as the number of nodes increases, the power consumption to that much number of nodes reduces up to certain extended depends upon the distance between the transmitting and receiving nodes. Here simulated results using Greedy algorithm shown, where the nodes distance is kept within the range of 10m to 100m and its power consumption is ranging from 0.2962J to 0.3459J. as shown in the table 2. These results are achieved using the algorithm 2 of Greedy Furthest Acoustic.

TABLE 2:

Parameters	Number of Nodes			
	25	*50*	*75*	*100*
Avg. Distance (m)	90.0642	89.2335	68.9515	57.6881
Avg. Energy (J)	0.4050	0.2007	0.2232	0.2052
Avg. Depth (m)	25	25	25	25
Avg. Time (ms)	0.22	0.31	0.28	0.38

VII. CONCLUSION

Research on underwater communications and the use of Underwater Sensor Networks is becoming a very hot topic because of the appearance of new marine/oceanographic applications. As a consequence, other available underwater acoustic technology can support mostly point-to-point, low-data-rate, delay-tolerant applications. Some of the shown experimental results for point-to-point acoustic modems use signaling schemes that can achieve data rates lower than 20 kbit/s with a link distance of 1 km over horizontal links. Whereas in the proposed system, where Communications is based on RF signal transmission offers great benefits such as, increase of the data rate of the link to transmit more information.

The underwater acoustic communication channel is model using Maximum Entropy modeling technique for Acoustic channel simulation with its root mean square. Doppler spread is 0.5 to 2 Hz. The Acoustic communication channel satisfy smart antenna approach by using IEEE standard 802.15.4 which gives the data transmission rate up to 250

Kbps at 2.4 GHZ carrier frequency for at least 2m vertical communication link and approximately 2m horizontal link by keeping the depth of water up to 1m, Since shallow water acoustic communication is consider. For this, the bandwidth was kept up to 2.4 GHz. The system can generate the maximum signal-to-noise ratio (SNR) is up to 1.477 dB and its Signal-Error-Rate (SER) is calculated as -14.9513 dB.

As the signal gets scattered in to the water, therefore orthogonal frequency division multiplexing technique is implemented, which divide the carriers into equivalent sub-carriers. Here 16 to 64 sub-carriers at the frequency of 3.6 MHz and each sub-carrier are made to process 256 bits per sub-channel; therefore, maximum 4096 bps to 16384 bps can be actually transmitted with the help of each sub-carrier. Based on this concept, the system is simulated for 25 numbers of nodes. For simulating this network the maximum energy required is 0.4094 Joules.

Thus, the smart underwater acoustic communication system is designed with fast communication and less power consumption.

This proposed system is developed with low cost consider for shallow water environment. Here the scattering function was developed for underwater data transmission. The results shown the minimum data scattered when it transmitted through the underwater channel. The channel is developed using entropy method, which gives the maximum data transmitted using this channel. The multipath fading and Doppler Effect was studied using OFDM technique and their respective results are shown. The hardware is developed using some sensor nodes for temperature, pressure and salinity. The salinity is calculated using titration due alkalinity method in the chemistry laboratory. The pressure is calculated using load cell which measure the pressure upto 40kg. the given results shows the maximum data can be transmitted through the Acoustic channel in less time using various sub-carriers, which can be shown in fig.1. The data absorption is shown in fig.3, which calculates the attenuation losses and spreading losses during underwater data transmission. The absorption

coefficient is proportional to its frequency. The system is designed using home-made sensors for various parameters and tested in the shallow water environment. The system further be tested in water tank, swimming tank and also in the lake, and their corresponding Matlab result will be shown for further study.

Acknowledgment

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Impact of Automation on the Test Insertion

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ABSTRACT

In the present scenario, the transistor size (channel length) is diminishing which has led to number of irregularities and manufacturing defects. Thus the testing of the manufacturing defects in an IC is very important. In this paper, we are presenting the impact of the flow automation on the test insertion. We have performed the test insertion through an automated flow for 28nm and 16FF test cases.

Keywords : Built in Self-Test, Design For Testability, Scan, Test Automation.

I. INTRODUCTION

Design for Testability is a design technique that adds certain testability features in the digital modules. The idea of the added features is that they make it easier to develop and apply manufacturing tests for the designed hardware.

The purpose of manufacturing tests is to validate that the product hardware contains no defects that could, otherwise, adversely affect the product's correct functioning.

Tests are applied at several steps in the hardware manufacturing flow. The tests generally are driven by test programs that execute in Automatic Test Equipment (ATE). In addition to finding and indicating the presence of defects (i.e., the test fails), tests may be able to log diagnostic information about the nature of the encountered test

fails. The diagnostic information can be used to locate the source of the failure.

In other words, the response of vectors (patterns) from a good circuit is compared with the response of vectors (using same patterns) from a DUT (device under test). If the response is the same or matches, the circuit is good. Otherwise, the circuit is faulty.

DFT plays an important role in the development of test programs and as an interface for test application and diagnostics. Automatic test pattern generation, or ATPG, is much easier if appropriate DFT rules and suggestions have been implemented.

Design for testability (DFT) makes it possible to:

· Assure the detection of all faults in a circuit.
· Reduce the cost and time associated with test development.
· Reduce the execution time of performing test on fabricated chips.

II. METHODOLOGY

The process of test insertion for checking the manufacturing faults is carried out as follows:

- Initially, the functionally verified timing closed netlist is passed through the process of BIST insertion for the memories, where the BIST engine produces the test pattern for the checking the correct working of memory elements. The Basic BIST

Architecture consists of the following components

Test pattern generator (TPG): Responsible for generating the test vectors based on the algorithm implemented, to cover the maximum faults[2].

Test Controller: Responsible for controlling the BIST components for self-test. It signals when BIST start and looks after the comparator, whether it is correctly comparing the right patterns. It finally signals the end of test and signals whether the memory has passed the test based on the ORA.

Output Response Analyzer: Responsible for signaling whether the memory is faulty or not. This is shown in Fig 1
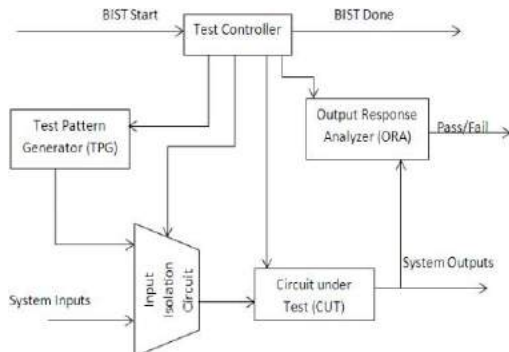
Fig. 1. BIST Architecture

This BIST insertion flow will produce a wrapper around the memory, processor to control the algorithm working, e-fuse which will contain the information regarding the repair that has to be performed. It also generates the server which will synchronize the operations of many processors.
- The BIST related Pins are pulled to the top level so that the test pins are controllable.
- The BIST Inserted Design is carried through the process of scan Insertion of Scan Insertion and Scan Stitching.

- Scan insertion with hierarchical flow: we will insert the scan flops(flops with a multiplexer at D Pin) as shown in the Fig 2.[2] This scan flops provide controllability and observability to the nodes from the top level. We will be using the core wrapped flow where the scan chains are differentiated into core scan chain and wrapper chain. [3]
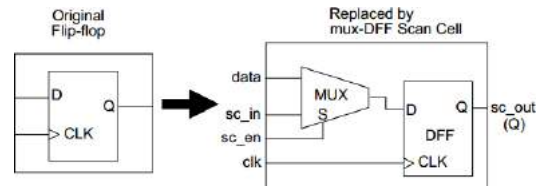
Fig.2. Scan Flop

Scan stitching: In this stage, stitching of scan flops inserted in the previous step is done. Here the scan stitching depends on the constraints given by the user such as maximum chain length, number of input channels and output channels etc.[5]
- Verification of test Insertion: we will generate the test patterns using the ATPG, which will be used for the detection of faults, which will be used for the verification of fault and test insertion.

III. ANALYSIS AND RESULTS

Designs need to be more test-friendly. Far too often, test is sacrificed for some other design criterion like speed, area and power. The design lacks the available resources to adequately address test issues up front, where their impact is felt least .More and more, problems in time-closure and testability cause a far greater resource and schedule impact than is saved by not addressing DFTA (design for test automation) issues during a design's initial development. By deferring complete test consideration until when the design is handed to test insertion flow, it is often too late to change the design the problem shifts

from a development group's design problem to a recurring nightmare for those involved in test-compliance and timing closure in the backend.

The impact non-DFTA compliance is felt with every ASIC that does test differently or incorporates components that are not DFTA- ready[4].

The consequences are quite costly if a non- DFTA-compliant design is accepted for signoff. It may lead to

· Poor test coverage.

· The result was that every design implemented test differently. The effort required to get through signoff was seldom known, with potential problems at any step. This leads to increased signoff effort.

· Error-prone not every nuance of a design could be verified to be correct if no standard existed with which to reference a design's compliance.

· Tasks repeated many times throughout the flow were bound to deviate ever so slightly from the way they were done before.

· Incorrect test structure connectivity, improperly executed test vector generation, and inadequate test coverage contributed to many protoholds and lost time.

The test insertion flow is shown in the Fig. 3.below
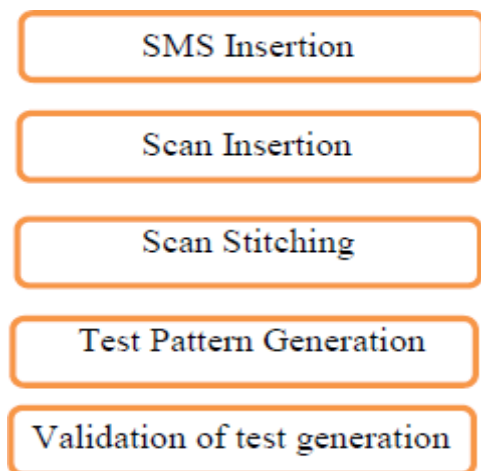
Fig. 3.Test Insertion Flow

The automated flow provides the following advantages like:

· This flow provides the architecture for the RTL based as well as Gate level design for insertion of test elements

· Enhanced architecture to have both ATE test and in-system test interface to be similar

· Overall reduced validation effort

· Utilize third party tool capabilities as much as possible.

· Complete Hierarchical DFT Implementation.

· Utilize standards IEEE P1500 for IP Test and SMS test[6].

Insertion of the test circuitry is carried out at the block level and top level for different test cases using an automated flow. Results Analysis is shown in the table below:

Testcase 1: two hard-macros are instantiated in the top level and no memories at the top level.

Testcase 2: two hard-macros along with large number of memories (with different configurations) are instantiated at the top level.

The run-time and memory utilization for the automated flow is as follows:

Testcase1:

Different stages of the flow	Run-time (in minutes)	Memory Required (in KB)
SMS Insertion	16	203316
TLI 1	11	883712
Scan Insertion	7	113489
TLI 2	11	902144
Scan Stitching	18	201578

Testcase 2:

Different stages of the flow	Run-time (in minutes)	Memory Required (in KB)
SMS Insertion	1470	127688788
TLI 1	145	30382404
Scan Insertion	140	27688788
TLI 2	211	64946176
Scan Stitching	1530	127762192

Block level (hard-macro)

Different stages of the flow	Run-time (in minutes)	Memory Required (in KB)
SMS Insertion	20	12304913
TLI 1	4	1002496
Scan Insertion and stitching	25	12600538
TLI 2	2	1019904

IV. CONCLUSION

This automated flow provides good test coverage and also provides standard methodology. The TAT (Turnaround Time) of the flow has to be enhanced. Also, the memory consumption by the individual stages of the flow is to be optimized.

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Carcinoma Detection using Convolution Neural Networks

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ABSTRACT

In this paper, we have proposed an optimized model which can predict the symptoms of breast cancer with an accuracy of 86%. The machine learned to predict test images at a more accurate rate than it could without optimization. Using Random forest, we got an accuracy of 83%. We have used Convolutional Neural Network to develop a model for breast cancer detection through a mammograph dataset. With the rapid development in deep learning, in the future, machine learning will surely bring much improvement in development of models for prediction, detection of several health issues even at an early stage and easier procedure. We have used Python language for the implementation of entire system.

Keywords : Convolution Neural Networks, Flattening, ReLU

I. INTRODUCTION

Breast Cancer is one of the leading cause of death in women all around the world. Cancer is a disease caused by the changes occurred in cells spreading uncontrollably. Lumps or masses are formed which is called tumour and it is named after the body part which it originates in. In breast cancer the pain is minimal to non-existent at early stage and can be treated easily, hence screening is important for early detection. 80% breast cancers are invasive and usually breast cancer is referred to single disease but there are up to 21 histological sub-categories. It has been observed that India has a much lower incidence of breast cancer than Western countries, even after adjusting for age structure of the population, about 1/3rd in urban areas and 1/9th in rural regions. The lack of population screening in India (and corresponding over diagnosis in Western populations) undoubtedly contributes to this statistic but more

importantly, so do lifestyle, reproductive and dietary factors.

Mammography is currently one of the best methods to detect breast cancer early. The magnetic resonance imaging (MRI) is the most attractive alternative to mammogram. However, the MRI test is done when the radiologists want to confirm about the existence of the tumour. The cons of the MRI is that the patient might show an allergic reaction to the contrasting agent, or skin infection could develop at the place of injection.

The application of visual classification motivates the use of computer-aided diagnosis (CAD) systems to improve the diagnosis accuracy, reduce human error, increase the level of inter-observer agreement, and increased reproducibility. Deep learning based approaches have shown to perform better than conventional machine learning methods in many image analysis task, automating end-to-end processing. Convolutional neural networks (CNN) have been successfully used for diabetic retinopathy

screening, bone disease prediction and age assessment, and other problems. Previous deep learning-based applications in histological

microscopic image analysis have demonstrated their potential to provide utility in diagnosing breast cancer. In this paper, we present a visual analysis approach for breast cancer classification. Here we make use of CNN (Convolutional Neural Networks) for feature extraction and classification.

II. MOTIVATION

The objective of using machine learning techniques is to develop a model which can be used for estimating, prediction, extraction of features, classification and so on. When a model is developed using machine learning techniques chances are there will be many training and generalizing errors. A good classification model should fit the training dataset and accurately classify all the instances. Any error on the training dataset will result to unreliable or inaccurate prediction of testing data. Also errors such as model over fitting can also occur even if the training error rate is reduced, which is achieved if the complexity of the model is increased.

Here we propose a classification model using Convolutional Neural Network (CNN), originally designed to mimic the neurons in the visual cortex, CNN are particularly good at classifying images. They work by sliding a filter around the input image, and multiplying the image by this filter at each step to create a new filtered image.

As mammography is a technique using X-rays to diagnose locate tumours in breast we considered CNN to be much ideal for developing a classification model for training, predicting, classification and other similar tasks.

III. IMPLEMENTATION

An overview of the approach towards the problem is given by the block diagram given below.
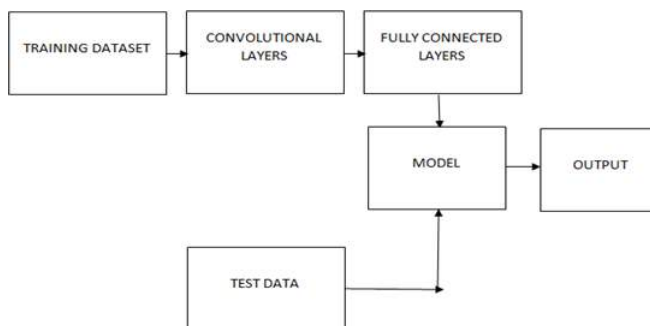
Fig. 1 Block Diagram of Breast Cancer Detection using Machine learning

A. Training Datasets

The dataset used here are a set of 9998 mammograph images which have been pre-labelled. Each images are of size: width-50, height-50, and depth-3. We split the datasets into test and training datasets in the ratio 1:4 i.e. 20% for test and remaining 80% for training. Even after splitting the dataset we make sure that the ratio of cancerous to non- cancerous data remains the same as the original dataset in the training and the test datasets.

B. Convolution Layer

It is the core building block of a CNN. Here weights, also known as filters, which is a small receptive field but extent to the full depth of the input volume. We take this filter and slide it over the image spatially and compute dot product at each spatial location. These filters learn different information present on the image like edges, bulge, corners etc. The result of the dot product is a 2-dimensional activation map of that filter. Hence a stack of such activation map for all the filters throughout the entire depth of the image forms the output volume of the convolutional layer. We can set up filters for low-level filter kernels for convolutional neural network, which means designing a filter for the input layer can be done but the hidden layer kernels are hard to engineer by

human. "End-to-end learning" is where only the input and the output ends are what the human provide while all other parameters are learned or provided by the model itself.

C. Pooling Layer

Pooling layer is another building block in CNN. It helps make the representation smaller and more manageable. It works on each activation map independently. There are different methods of pooling – Mean pooling, Max pooling and Sum pooling. The most preferred being Max pooling.

D. ReLU

Rectifier is an activation function defined as the positive part of its argument. Mathematically, it is defined as

$$y = \max (0, x) \qquad (1)$$

ReLU is the most commonly used activation function in neural networks, especially in CNNs. If you are unsure what activation function to use in your network, ReLU is usually a good first choice.
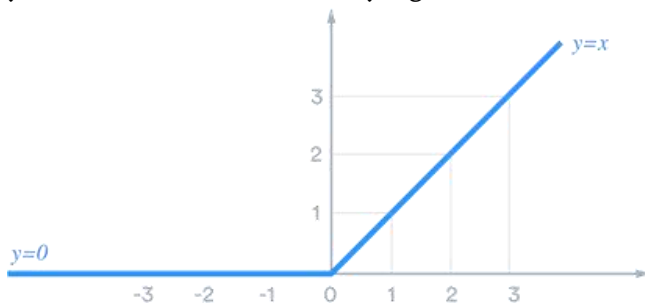
Fig. 2 ReLU activation function

E. Flattening

Flattening is the process of converting the resultant 2- dimensional array into a single continuous linear vector. This is required for feeding the collected features into the fully connected network.
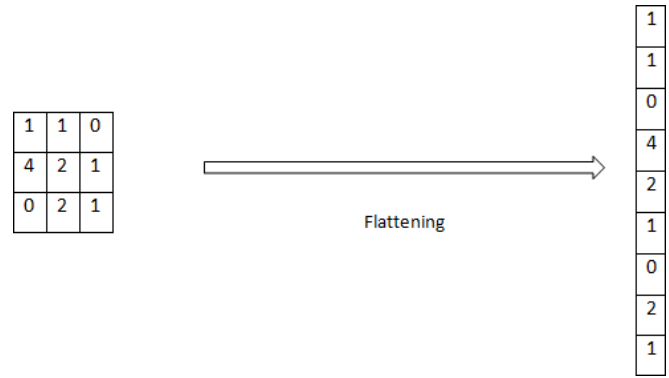
Fig. 3. Flattening process

IV. FLOWCHART
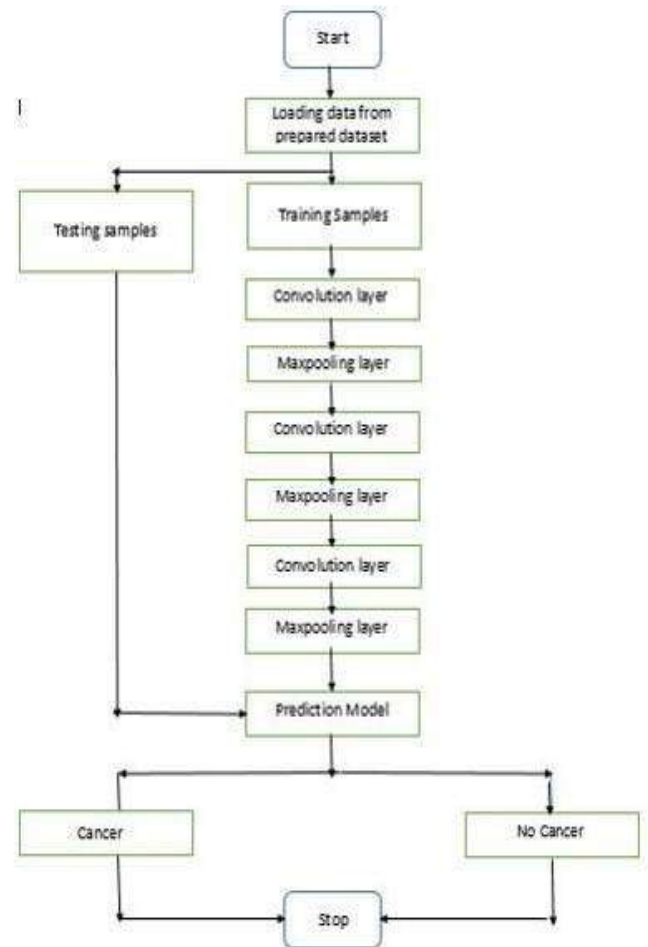
Fig. 4 Flowchart of the process

The above figure represents the flowchart of the code used in detection of cancer using CNN.

V. RESULTS

A. Classification using Random Forest

```
In [13]: v = val = val_features.reshape(val_features.shape[0], -1)
         clf.score(val, y_val)
Out[13]: 0.829
```

B. Classification using CNN

```
model.evaluate(val_features, alt_num_labs_val)

Epoch 1/15
8998/8998 [==============================] - 3s 364u
Epoch 2/15
8998/8998 [==============================] - 3s 335u
Epoch 3/15
8998/8998 [==============================] - 3s 335u
Epoch 4/15
8998/8998 [==============================] - 3s 337u
Epoch 5/15
8998/8998 [==============================] - 3s 339u
Epoch 6/15
8998/8998 [==============================] - 3s 343u
Epoch 7/15
8998/8998 [==============================] - 3s 352u
Epoch 8/15
8998/8998 [==============================] - 3s 347u
Epoch 9/15
8998/8998 [==============================] - 3s 338u
Epoch 10/15
8998/8998 [==============================] - 3s 341u
Epoch 11/15
8998/8998 [==============================] - 3s 339u
Epoch 12/15
8998/8998 [==============================] - 3s 337u
Epoch 13/15
8998/8998 [==============================] - 3s 339u
Epoch 14/15
8998/8998 [==============================] - 3s 341u
Epoch 15/15
8998/8998 [==============================] - 3s 342u
1000/1000 [==============================] - 0s 106u

Out[14]: [1.302553077191289, 0.844]
```

C. Classifiaction using Optimised version of CNN

```
Train on 8998 samples, validate on 1000 samples
Epoch 1/50
8998/8998 [==============================] - 3s 294us/step - loss: 1.0950 - acc: 0.8200 - val_loss:
Epoch 2/50
8998/8998 [==============================] - 2s 275us/step - loss: 0.6724 - acc: 0.8554 - val_loss:
Epoch 3/50
8998/8998 [==============================] - 2s 275us/step - loss: 0.5484 - acc: 0.8693 - val_loss:
Epoch 4/50
8998/8998 [==============================] - 2s 273us/step - loss: 0.4574 - acc: 0.8803 - val_loss:
Epoch 5/50
8998/8998 [==============================] - 2s 277us/step - loss: 0.4099 - acc: 0.8853 - val_loss:

Epoch 00005: ReduceLROnPlateau reducing learning rate to 3.999998989515007e-05.
Epoch 6/50
8998/8998 [==============================] - 3s 283us/step - loss: 0.2137 - acc: 0.9292 - val_loss:
Epoch 7/50
8998/8998 [==============================] - 3s 279us/step - loss: 0.1864 - acc: 0.9363 - val_loss:
Epoch 8/50
8998/8998 [==============================] - 2s 278us/step - loss: 0.1729 - acc: 0.9402 - val_loss:
Epoch 9/50
8998/8998 [==============================] - 3s 278us/step - loss: 0.1657 - acc: 0.9447 - val_loss:

Epoch 00009: ReduceLROnPlateau reducing learning rate to 7.999997979083002e-06.
Epoch 10/50
8998/8998 [==============================] - 2s 277us/step - loss: 0.1412 - acc: 0.9540 - val_loss:
Epoch 11/50
8998/8998 [==============================] - 3s 278us/step - loss: 0.1382 - acc: 0.9540 - val_loss:
Epoch 12/50
8998/8998 [==============================] - 3s 279us/step - loss: 0.1365 - acc: 0.9568 - val_loss:
Epoch 13/50
8998/8998 [==============================] - 3s 281us/step - loss: 0.1342 - acc: 0.9574 - val_loss:

Epoch 00013: ReduceLROnPlateau reducing learning rate to 1.5999999595603884e-06.
Epoch 14/50
8998/8998 [==============================] - 3s 279us/step - loss: 0.1301 - acc: 0.9583 - val_loss:
Epoch 15/50
8998/8998 [==============================] - 3s 279us/step - loss: 0.1297 - acc: 0.9583 - val_loss:
Epoch 16/50
8998/8998 [==============================] - 3s 280us/step - loss: 0.1294 - acc: 0.9583 - val_loss:

Epoch 00016: ReduceLROnPlateau reducing learning rate to 3.200000037395512e-07.
Epoch 17/50
8998/8998 [==============================] - 3s 284us/step - loss: 0.1284 - acc: 0.9583 - val_loss:
Epoch 18/50
8998/8998 [==============================] - 3s 282us/step - loss: 0.1284 - acc: 0.9587 - val_loss:
Epoch 00018: early stopping
```

D. Graph
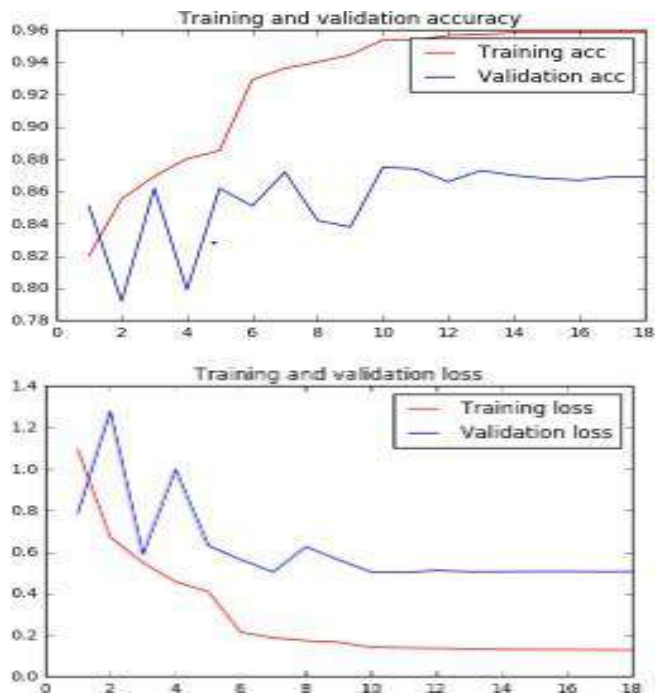
Fig. 5. Graph showing Training and Validation Loss and Accuracy

E. Prediction of Cancerous and Non-cancerous Images

```
In [20]: labs_pred = model.predict(tr_flat[:10])
         pred = [np.where(i == max(i))[0][0] for i in labs_pred]
         pred

Out[20]: [0, 1, 0, 0, 0, 0, 0, 1, 0]

In [21]: path = r'E:/New folder/18302/1/18302_idx5_x501_y1601_class1.png'

         import cv2

         image = cv2.imread(path)
         image = image.reshape(1, image.shape[0], image.shape[1], image.shape[2])

         _sp_features = conv_base.predict(np.array(image), batch_size=BATCH_SIZE, verbose=1)

         class_lab = ["No Cancer", "Cancer"]

         sp_features = _sp_features.reshape(-1, 512)

         lab = model.predict(sp_features)
         pred = [np.where(i == max(i))[0][0] for i in lab]

         print("Diagnosis (predicted):", class_lab[pred[0]])

         1/1 [==============================] - 0s 78ms/step
         Diagnosis (predicted): Cancer
```

VI. CONCLUSION

From a total of 9998 mammograph data, with 90% data as training data and 10 % as test data we developed a optimized model which can predict with an accuracy of 86%. The machine learned to predict test images at a more accurate rate than it could without optimization. Using Random forest, we got an accuracy of 83%. This level of accuracy is decent but when it can be seen that there is almost 17% chance for the machine's prediction to go wrong. This may cost the patient to suffer more due to late detection and in worst case scenario even death. Overall, we conclude that using Convolutional Neural Network to develop a model for breast cancer detection through a mammograph dataset is way better than Random forest Classifier or any other classifiers. With the rapid development in deep learning, in the future, machine learning will surely bring much improvement in development of models for prediction, detection of several health issues even at an early stage and easier procedure.

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Design and Implementation of a Multiply-Accumulate (MAC)unit

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ABSTRACT

This paper studies the data-path and VLSI implementation of multiply accumulate (MAC) unit. MAC unit performs multiplication and accumulation process and is an important operation in many of the digital signal processing (DSP) applications. The multiplier is designed using Wallace multiplier and the adder is designed as a carry look ahead adder. The performance analysis of MAC unit is done in terms of area and delay. The design of the MAC model is done in Verilog HDL. The MAC unit is then simulated and synthesized in Xilinx ISE 14.7 for Artix 7 family and the performance analysis is done in terms of area and delay.

Keywords : Accumulate; High Performance; Carry Look Ahead Adder; Wallace

I. INTRODUCTION

A MAC unit performs extensive data manipulation and complex mathematical operations in various DSP applications, image and video processing etc. It lies in the decisive path of a system and plays a vital role in determining the overall operational speed and power of the hardware.. MAC unit is a fundamental block in the computing devices, especially Digital Signal Processor (DSP). Recently, there has been an explosive growth in the development of portable communication devices like mobile phones, IPADS and note books in the field of semiconductor design. Modern computers usually contain a dedicated MAC unit which comprises of a multiplier followed by an adder implemented using some combinational logic with a register to store the results. These real time processing systems perform high computational operations, mainly in the form of Multiply Accumulate (MAC) and butterfly. However, these systems consume high power and are characterized by high data throughput rate.

MAC is a major component used in communication systems like OFDM based wireless devices, Wireless Code Division Multiple Access (WCDMA), base station receivers, channel estimators and so on. Low power architecture design becomes crucial in MAC block. The architecture selection for MAC unit generally depends upon the type of applications.

Recursive architecture:- For embedded microprocessor or micro controller applications the memory usage is limited and the operand size is also small. Recursive architecture is suitable, when power and area is important. This recursive MAC unit is used in image processing application such as Fast Fourier Transform(FFT) and digital filtering.

Parallel architecture:-For high performance applications like notepads, laptops and desktops require large set of data computation.

Shared segmented architecture:- In order to perform multi-mode logic dependent operation, where the speed and power constraint is considered in which is mainly used in embedded medical equipment and in communication systems, such as Orthogonal Frequency Division Multiplexing (OFDM) based wireless devices, sub carrier frequency domain operations, channel estimator and carrier synchronizer.

The paper is organized as follows. Section II describes the MAC unit architecture. Section III discuss about the results obtained and section IV concludes the paper.

II. MAC ARCHITECTURE

The MAC unit basically supports multiply – accumulate operations of signed, unsigned and signed fractional operands. MAC architecture consists of multiplier, adder and an accumulator to reduce delay and improve the speed of the MAC. The product of the two input number are computed first and the result is forwarded for addition or accumulation. If both the computing is executed in a single rounding then it is referred to as a fused MAC Unit. The generated final results of the MAC unit are stored in adequate memory locations.

Multipliers in MAC are usually complex circuits and must operate at high system clock rate. Reducing the delay of multiplier is an essential part, in order to satisfy the overall design performance. An adder or summer is a digital circuit used to add binary numbers. They are also provisioned to add/ subtract signed numbers. A Carry Look Ahead adder is used here to greatly reduce the carry propagate delay and to improve the speed of operation.

Main goal of MAC is to increase the speed which in turn should decrease the delay and consume less power. MAC is always a key element to achieve a high-performance digital signal processing application for real time signal processing applications.
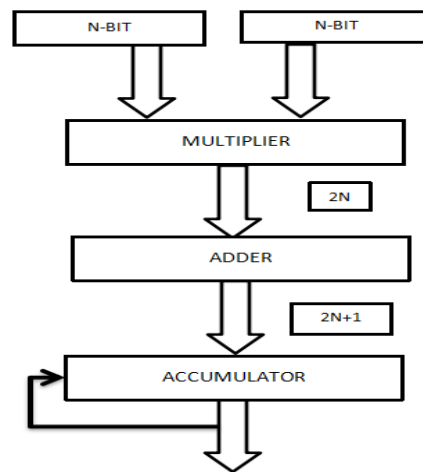
Fig 1: MAC unit

The various sub blocks of MAC unit are discussed in the following sections.

A) MULTIPLIER

In today's digital signal processing field binary multipliers plays a very important role. Addition and multiplication of two binary numbers are the basic and most commonly used arithmetic operations. It is an important arithmetic operation which consumes considerable power and takes up a large area in the architecture.70% of instructions in microprocessors and most of the DSP systems use multiplication as the basic arithmetic operation which greatly affects the execution time.
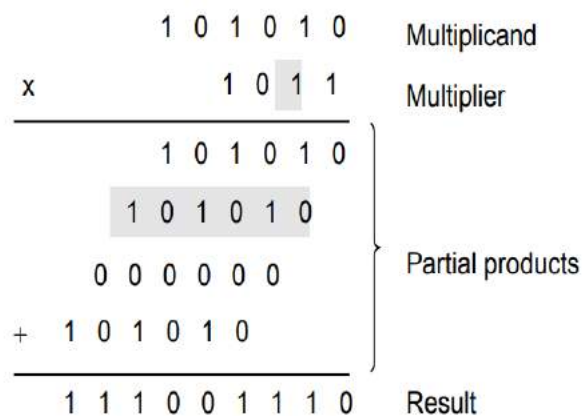
Fig 2: Operation of multiplier with partial products

Multiplication of binary numbers is usually implemented by using repeated addition and shift operations as shown the fig 2. Some binary adders are designed to perform the addition operation for only 2 binary numbers at a time instead of adding all partial products and resulting in increased delay and

power consumption. Therefore Multiplication dominates the execution time of the most DSP, and hence it determines the overall performance of the system. Thus this paper adopts some advanced multiplier designs in the MAC unit to enhance the speed of the system.

WALLACE TREE MULTIPLIER

A fast process and efficient hardware implementation for multiplication of two numbers was established by Australian computer scientist Chris Wallace. In the Wallace tree technique, there are three bits which are passed to a one bit full adder which is known as a three input Wallace tree circuit, and one of the output of the full adder is sum which is supplied to the next stage full adder of the same bit. And the carry output signal is passed to the next stage full adder of the same no of bit, and the carry output signal there is supplied to the next stage of the full adder which is located at a one bit higher position. The circuit design is not easy in the Wallace tree technique, although the speed of the operation is high. The addition is performed using a Carry Look Ahead adder to increase the speed of addition.

B) CARRY LOOK AHEAD ADDER

The Ripple carry Adder is the simplest implementation with low power consumption and compact layout. However the delay of a RCA is directly proportional to the number of input bits thereby limiting the performance of the adder. A Carry Look ahead-Adder was developed by Weinberger and Smith .The Carry Look Ahead logic is based on generating and propagating carry. It allows the circuits to pre - process the input bits being added to predict the carry ahead of time thereby eliminating the wait time. A Carry Look ahead Adder (CLA) is superior to conventional full adder in terms of speed which is the most important factor in the digital circuit. During the addition of two binary numbers, the sum is not obtained instantaneously as the gates inside the adder circuits take some time to produce the output which is the

propagation delay and this delay is different for sum and carries output. The delay in producing the final carry is large in a conventional ripple carry adder as it has to pass through a long carry chain. But in CLA, using the generate and propagate terms, it can predict the carry in advance which enhances the parallel addition and reduces the carry propagation time thereby increasing the speed of addition.

The Propagate P and generate G in a full-adder with inputs A and B are given as:

$P_i = A_i \oplus B_i$ Carry propagate

$G_i = A_i . B_i$ Carry generate

Here it is observed that both the propagate and generate signals are dependent only on the input bits and hence can be deduced from after one gate delay.

The CLA adder is one of the fastest schemes used for the addition of two numbers. The Carry Look Ahead Adder uses modified full adders for each bit position. However the circuitry gets complicated as the number of variables increase and the increased hardware make it a costlier option
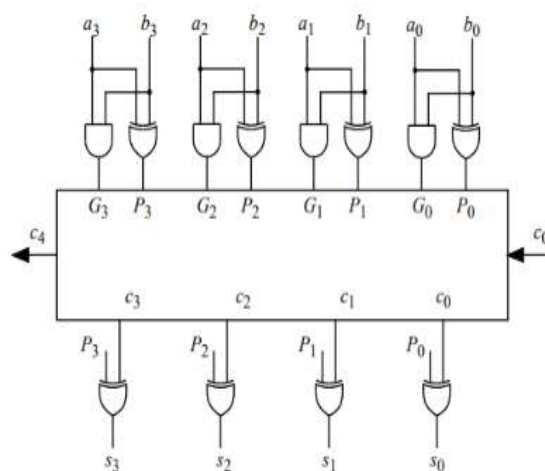
Fig 3: Carry look ahead adder

C) ACCUMULATOR

Accumulator is a register which stores the value. Depending upon the clock and reset the accumulator works and stores the data for every clock pulse.

III. RESULTS AND DISCUSSION

The following table shows the Synthesis result for the target device xc7a100t-3-csg324 for the study on Mac unit.

Table 1: Synthesis report for the target device xc7a100t-3-csg324

Number of Slice Registers	8
Number of Slice LUTs	49
Number of IOs	34
Delay	4.68 ns

The following figures shows the simulation result of carry look ahead adder, Wallace tree multipliers and the MAC unit.
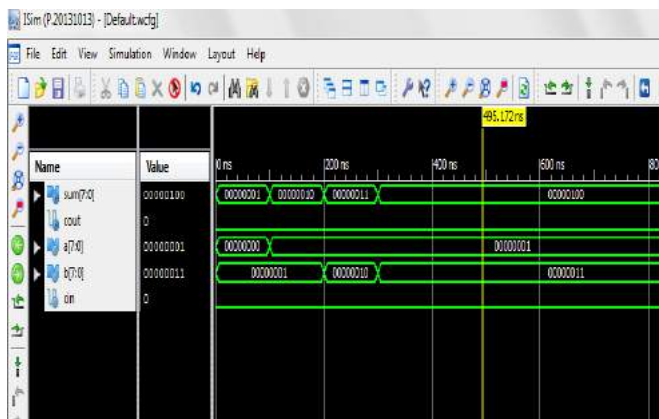
Fig 4: Simulation result of Carry look ahead adder
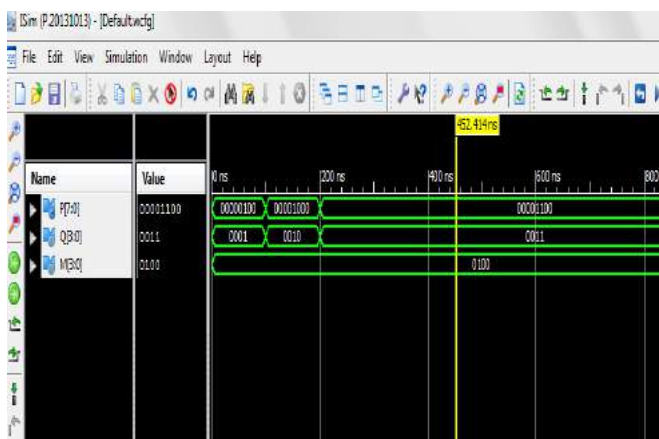
Fig 5: Simulation result of Wallace multiplier
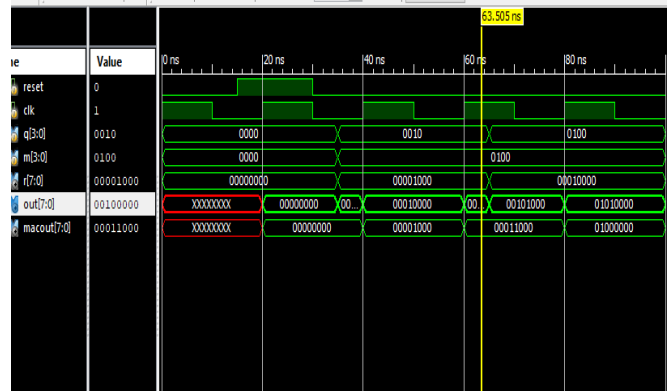
Fig 6: Simulation result of MAC unit

IV. CONCLUSION

This work investigates the behaviour of a MAC unit using Wallace tree multipliers, carry look ahead adder and accumulator. The results shows the outputs of the various sample cases. The synthesis of the design shows that, the design comsumes optimum area and delay when compared to the MAC using conventional multipliers and adders. The future work includes enhnacing the MAC design using other multiplier circuits which can result in a better delay, area and power consumption.

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A Hybrid Segmentation Approach to Diagnose Suspicious Pixel regions in Liver CT Images

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ABSTRACT

This paper introduces computer aided liver analysis to diagnosis the suspicious pixel region (lesion) from abdominal CT images of liver and helps the radiologists in categorizing liver into typical or anomalous liver . Segmenting the liver and separating the region of interest is a difficult procedure in the field of malignant growth imaging because of the little recognizable changes between healthy tissues and unhealthy tissues. In this paper, segmentation of liver from abdominal CT image based on hybrid method is proposed. The method uses neutromatic logic with FCM thresholding, encouraged by pre processing using bilateral filter and post processing using morphological tasks for automatic segmentation of liver and finally dynamic thresholding and contour detection   to extract the lesion (tumor). The effectiveness of proposed method is quantitatively evaluated by comparing automatic segmentation results with ground truth obtained from radiologists.

Keywords : Bilateral filter, Neutromatic logic, Fuzzy C means, Thresholding, morphological operation.

I. INTRODUCTION

Liver [3] is the largest and increasingly significant organ for survival. It also inclined to several types of ailments. Liver diseases have various colors. For example, blue indicate cyst, yellow color shows fatty liver , dark brown colored is fibrosis and so on. A mass of extra tissue called tumor or lesion, new formation of cells of independent growth, no useful function and has no typical termination. Liver tumor are abnormal tissue on the liver and can be benign (non- cancerous) or malignant (cancerous) tumor. Due to advances in computer technology, image-processing technology has been used to assist physicians in identifying cancer in liver. The intensity of the tumor can be lower or higher than that of the liver. The main problem of liver tumor

detection is due to low contrast difference between tumor and liver intensity values.

Different imaging procedures [3] like ultrasound, Tomography Imaging, Magnetic resonance imaging, positrons emission tomography etc are accessible for determination of liver infection. Among these, CT scan is a notable non-invasive imaging method and it is suggested by pathologists since this imaging have better spatial resolution, high noise suppression, less time to examine the ROI and patient friendly protocols. It also gives the detailed information of anatomical

Data about the visualized structure. Conventional method of segmenting the liver is laborious and tedious task for   radiologists.   Automatic segmentation is more difficult due to more than 150 slice of liver CT image, low contrast, similar intensity

of liver and tumor. Thus, there is a need for CAD system to diagnose of tumor from huge amount of medical data.

CAD [8] system guide health care radiologists to diagnose the data and identify the diseases, find extent of disease thereby providing the second opinion during diagnosis decision. CAD system also reducing inter and intra observer variability in image interpretation. The efficiency of CAD system depends on speed, automation and accuracy level. It provides second opinion about the diseases. Three key component of CAD system are segmentation, feature extraction and classification. These components are responsible for diagnosis of suspicious pixels of benign and malignant masses. Accurate liver segmentation is crucial task in CAD system. Because feature based liver classification fully rely on segmentation accuracy. Inaccurate segmentation leads to large variation in intensity texture and bad contrast. The proper choice of segmentation is very much essential.

Hybrid approaches [2] are attracting a great deal of attention at present. Pros of hybrid approaches are improved efficiency and better accuracy, thereby providing high quality of images. In this paper, Neutromatic based fully automated liver segmentation method is proposed. In medical applications, it is attractive to deal with true fact of the disease as well as false statements and the imprecise statements to know the growth of the diseases in future occurrence. It is hard for conventional fuzzy set to resolve such issues. The main difference between Neutromatic logic (NL) and fuzzy logic (FL) is that the NL extends FL by assigning a membership function ranging in degree between 0 and 1 to variables. NL introduces a new component called indeterminacy that carries more information than FL.

The framing work of this paper is sorted as below: Section 2 discusses about the existing work and Section 3 gives a details information of the proposed technique. Section 4 examines the experimental outcomes and performance analysis. Section 5 provides the conclusions and Section 6 suggests scope for future work.

II. RELATED WORK

Segmentation of liver is an open challenge for researchers. Many researchers have used various strategies and systems to separate the liver and tumor from the abdominal CT images over the ongoing years [16-20].

K.Mala et.al [10] proposed adaptive threshold decision based on intensity information for segmenting the liver and classification is based on threshold decision .The drawback is more memory space. In [3-5], authors presented automatic segmentation of liver using region growing method. SS Kumar et. al [3] presented automatic segmentation of liver and tumor using region growing method and drawback is selection of seed point. Incorrect seed point selection leads to over segmentation. In [5], presented survey of various segmentation methods for CT scan images based on morphology, thresholding and Neural network. In Raju et. al [9], developed a method on diagnosis of liver tumor. The method was more effective to minimize the risk of cutting healthy liver tissues but dataset is limited.

In [1], author proposed comparative study of liver segmentation based on SRG, label connected component and hybrid method. It overall accuracy is 83%. To segment the largest contour in abdominal image, the author [2] proposed the hybrid approach using watershed method It overall accuracy is 92%. The problems in existing methods are time consuming , high processing time by region growing, label connected component and quality comparison difficulties. The above problems are overcome by an effective hybrid algorithm which is the combination of NM logic with 3 class FCM thresholding and connected component method along with contour

detection is proposed in our work for automatic liver and tumor segmentation

III. METHODS AND MATERIAL

A. Abdominal CT image

Computer Tomography [3] examination consolidates arrangements of X-ray beams taken from different angles and use computer handling process to deliver the cross sectional details of the human body. It provide the details information of the internal organs and helps radiologists to diagnosis the diseases and to confirm the presence of tumor, size and exact location of it. Liver is the largest organ in the abdomen and reddish in color, feels rubbery to touch. Liver segmentation is challenging task due to the similar intensity between liver and adjacent organs. Figure 1 shows the abdominal CT image of liver.

Figure 1. CT image

B. Preprocessing

Preprocessing [11,20] is a important step in tumor segmentation task. If the segmentation results are not accurate, that leads to improper extraction of features and irregular classification of that tumor. CT images are collected by different types of sensors and they contaminated by different types of noises. For accurate and fast liver segmentation, Pre-processing is essential. Bilateral filter is taken as pre-processing filter.

Bilateral filter [15] is a non linear, non iterative, noise reducing smoothing filter which is developed by Tomasi. This filter is obtained by the combination of weighted function two Gaussian filter: partial domain and intensity domain. The pixel intensity value is replaced by a value which is dependent on the neighbouring pixel location and difference in intensity. The idea is that the pixels which are close by will vary very little, so it is best to average the pixels in a small area.

Let Y is an image. Then Ip is value of the image Y at pixel position p. Bif (Y) is the output of bilateral filter, applied to an Image Y.

Spatial distance is calculated as

$$sp_d(p,q) = e^{-||p-q||^2}/2\sigma_{sd}^2 \qquad (1)$$

Intensity difference is calculated as

$$Int_d(p,q) = e^{-|I(p)-I(q)|^2}/2\sigma_{id}^2 \qquad (2)$$

σsd and σid are guassian kernel coefficient which controls spatial distance and intensity difference. σsd is directly proportional to image size. σid is directly proportional to edge amplitude. These two parameters are used for controlling the tradeoff of the weights in spatial and intensity domain.

At pixel p

$$Bif(p) = \frac{1}{C}\sum_{q\in\gamma(p)} Bif(q)sp_d(p,q)Int_d(p,q) \quad (3)$$

Where C is a normalization factor $C=\sum sp_d(p,q)\,Int_d(p,q)$ and shows the spatial neighbourhood of Bif(p).

Above formula is used to replace each pixel by the weighted average of values from nearby pixels

Bilateral filter Algorithm

Input: CT Image

Output: Preprocessed image

1. Use acculite software to convert DICOM image to JPEG format.

2. Convert that CT image to grey scale image.

3. Select the different attributes for the bilateral filter r w, σsd and σid

4. Do the following procedure for each pixel elements.

5. Use equation 1 to find the spatial distance.

6. Calculate the intensity difference using the equation 2.

7. Obtain the resultant pre processed image using equation 3.

C. Segmentation

Neutrosophic theory [1,21] or Neutromatic theory considers the proposition, theory, event, concept or entity and it is basis of neutrosophic logic. Neutrosophic set or Neutromatic set , a part of philosophy, deals with the origin, kind or nature, of neutralities. To handle uncertainty, fuzzy set has been used. In medical system we have to consider the truth (T), and false (F) statement as well as neutral static (possibilities of occurrence).

A Neutromatic image NI is characterized by three subsets T, I and F. The flow graph of proposed method is shown in Figure 2.The pixel P(m, n) in the image domain is transformed into Neutrosophic domain NI(m,n) ={Tr(m, n), In (m, n), Fa(m, n)},where Tr(m, n), In(m, n), Fa(m, n) are the probabilities belong to white set(object), indeterminate set(edge) and non-white set (background), respectively. Mathematically, a NI image is defined as in the following equations:

$$Tr(m,n) = \frac{\overline{g(m,n)} - \overline{g_{min}}}{\overline{g_{max}} - \overline{g_{min}}} \tag{4}$$

$$In(m,n) = 1 - \frac{\overline{Ho(m,n)} - \overline{Ho_{min}}}{\overline{Ho_{max}} - \overline{Ho_{min}}} \tag{5}$$

$$Fa(m,n) = 1 - Tr(m,n) \tag{6}$$

$$Ho(m,n) = abs(g(m,n) - \overline{g(m,n)}) \tag{7}$$

Algorithm for converting neutromatic image to binary image

Input: Preprocessed Image
Output: Binary image

1. Determine the histogram of preprocessed image.

2. Calculate local maxima of the histogram and mean of local maxima.

3. First peak of which is greater than the mean of local maxima gives us the gmin and the last peak gives us the gmax

4. Determine Tr(m,n) from local of mean window , gmin and gmax.

5. Calculate In(m,n) from the homogeneity value of Tr

6. Calculate Fa(m,n)

7. Find adaptive threshold for Tr,In,Fa using 3 class FCM thresholding.

8. Map Fuzzy Neutromatic Image into Binary Image.

9. The binary image is applied with the Connected Component algorithm.

D. Connected Component Algorithm

To find the similar regions in an image, label connected component algorithm is used. It is a graphical approach based effective segmentation algorithms used for region labeling. The algorithm works for medical images, microscopy images, binary image and thresholded image. To compute connected components [1] of an image, split the image into horizontal runs of adjacent pixels, and then label the runs uniquely. In the second pass, adjacent runs of different labels are merged. The algorithms ensure regions of similar value are labeled with one label. Two steps in label connected components are extracting of connected component and searching of largest component.

```
┌─────────────────────────────┐
│     Preprocessed image      │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────────────────┐
│  Convert preprocessed image into NI image│
│         (Determine Tr,In,Fa)             │
└─────────────────────────────────────────┘
              ⇓
┌─────────────────────────────────────────┐
│    Convert NI image into Binary Image.   │
│        (Apply FCM Thresholding)          │
└─────────────────────────────────────────┘
              ⇓
┌─────────────────────────────────────────┐
│         Apply CCL Algorithm              │
└─────────────────────────────────────────┘
              ⇓
┌─────────────────────────────────────────┐
│           Segmented Liver                │
└─────────────────────────────────────────┘
```
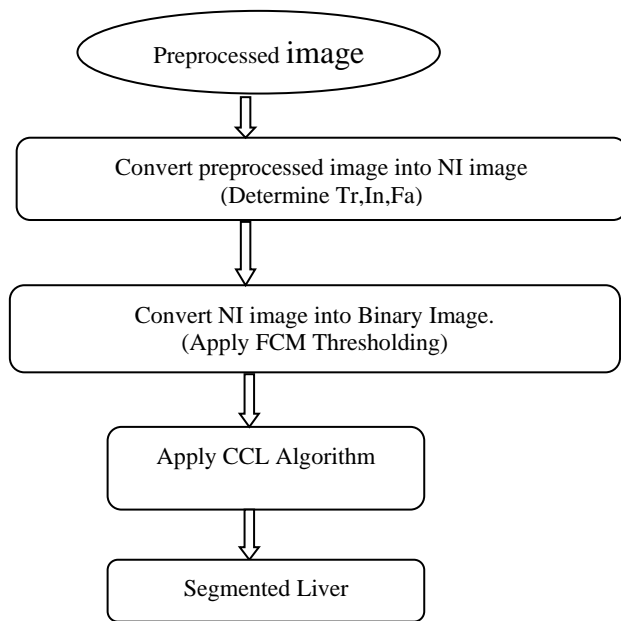
E. Morphological Operation

To separate the shape information, Morphology [3,7,16] tool is used. This method uses the structuring elements for the representation and description of region shape such as boundaries and skeleton. Dilation, erosion, opening and closing are most elementary morphological operations and defined with union and intersection operation.n the proposed method, opening is used to refine the boundaries of an image in the liver.

F. Post processing Phase

To obtain a perfect liver [7], the morphological tool for opening operation is used along with a structure element of radius 3. In this phase, the resulting image is complemented and multiplied with original image to get segmented liver. Followed by morphological operation, masking and dynamic thresholding was performed to extract the tumor.

IV. RESULTS AND DISCUSSION

A. Performance Measures

The proposed method uses several performance metrics to evaluate the performance of hybrid method. These measures are: Dice Coefficient, Jaccard coefficient, True Positive fraction and true negative fraction.

First metric is Dice Index [7] also called overlap index and it is mostly used metric in medical image segmentation. This index gives the correlation of automatic segmented output with ground truth image. And it defined as follows

$$Dice = \frac{2|A \cap M|}{|A+M|} \qquad (8)$$

Jaccard coefficient between automatic and ground truth segmentation is defined by intersection divided by union and is given by

$$Jaccard = \frac{|A \cap M|}{|A \cup M|} = \frac{|A \cap M|}{|A|+|M|-|A \cap M|} = \frac{Dice}{2-Dice} \qquad (9)$$

Third metric is True positive fraction [2]also called Sensitivity and Recall, measures the portion of positive voxels in the ground truth that are also identified as positive by the segmentation being evaluated.

$$True\ Positive\ fraction = \frac{|A \cap M|}{M} \qquad (10)$$

Fourth metrix is True negative fraction also called specificity , measures the portion of negative voxels (background) in the ground truth that are also identified as negative by the segmentation being evaluated.

$$True\ Negative\ fraction = 1 - \frac{|A-M|}{M} \qquad (11)$$

Finally , misclassification rate is defined as follows

$$Misclassification\ Rate = 1 - \frac{|A \cap M|}{M} \qquad (12)$$

Where A is Number of pixels of the automatically segmented liver regions and M is number of pixels of the manually segmented liver (ground truth) by the experts.Either Dice index or Jaccard coefficient is considered for evaluating the performance of proposed method.

B.CT dataset

The proposed method is tested on abdominal CT images. These images are acquired and collected from various sources like diagnostic scan centre and from internet along with ground truth image. Ground truth is used as bench mark for evaluation of segmentation methods. The dataset includes different

cases of liver diseases with different shape and intensity. For this work, dataset contains normal, fatty, cirrhotic, overextended livers and livers with cancer are considered.

C. Results and Discussion

The proposed approach uses axial CT images of abdomen for analysis. In this work, 25 Images is taken and tested to know the abnormality in abdominal CT images. All images are in DICOM format and exported to jpeg format using acculite software. The proposed works are carried out on Pentium processor and implemented in Matlab 13.

Figure 4 shows the overall output of proposed method. Figure 4A original CT image. Preprocessed output is shown in Figure 4B. Preprocessed image is transformed into NI domain image. Results of True domain and false domain are shown in Figure 4C and 4D. Enhance image is shown in Figure 4E. Homogeneity and Indeterminate image is shown in figure 4F and 4G. Apply FCM thresholding for NL image and output is shown in Figure 4H. Region of liver is obtained after applying connected component algorithm shown in Figure 4I. Segmented liver is shown in Figure 4J.Superimposed liver and tumor images with original images are shown in Figure 4K. Extracted tumor after post processing is shown in Figure 4L. Using the proposed method, both tumor and liver can be seen together. This helps radiologist to analyze the Suspicious Pixels .

The performance of the proposed method are evaluated and compared with the result of manual segmentation done by experts. Proposed method (PM) runs for Dataset contains 25 images but the result shown for 5 test images in the Table 1 and 2. Table 1 shows liver segmentation output and Table 2 shows lesion segmentation output. The proposed method is compared with ground truth (GT) and performance measures are done in terms of Dice, TRF and MCF. For 5 set of test images, the proposed method gives an accuracy of 98% in case of liver segmentation and 95% in case of lesion segmentation.

Figure 4 shows the output of proposed method
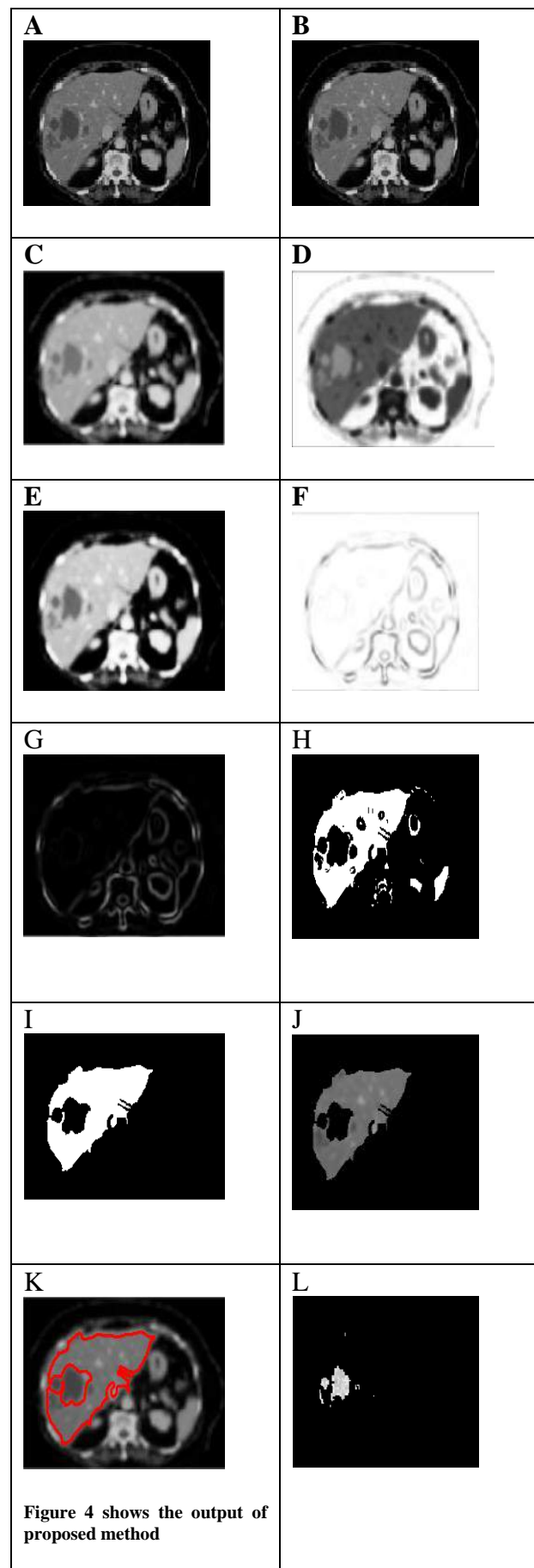
Figure 4 shows the output of proposed method

Table 1: Liver Segmentation Results

	PM	GT	Dice	TRF	MCF
DT1	41096	42123	0.9877	0.975	0.024
DT2	2788	3103	0.9634	0.929	0.070
DT3	7102	7258	0.9891	0.978	0.022
DT4	13309	13886	0.9788	0.958	0.041
DT5	1344	1942	0.9862	0.972	0.027

Table 2: Lesion Segmentation Results

	PM	GT	Dice	TPf	MC
DT1	1734	1959	0.9391	0.8851	0.1149
DT2	476	498	0.9774	0.9558	0.0442
DT3	530	559	0.9734	0.9481	0.0519
DT4	934	969	0.9347	0.8774	0.1226
DT5	645	678	0.9452	0.8960	0.1039

In order to know the lesion area in liver portion, lesion to liver ration was calculated and tabulated in Table 3.

Table 3: Lesion/Liver Ratio

Datasets	lesion area in Pixels	liver area in pixels	Lesion/liver ratio
DT1	1734	41096	0.0421
DT2	476	2788	0.170
DT3	530	7102	0.0746
DT4	934	13309	0.07017
DT5	845	1344	0.4799

Figure 5 shows suspicious pixels in liver region. In rder to validate the esults , the results of the proposed work also compared with the result of previous work stated in the comparative study of [1]. The approaches are Histogram thresholding, seeded region growing algorithm, label connected component and NS with thresholding. The results of different segmentation techniques are stated in Table 4.
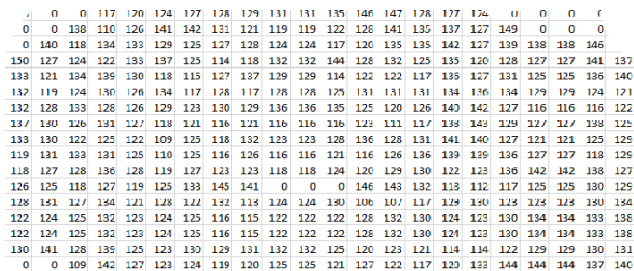
Figure 5 shows suspicious pixels in liver region

Table 4: Comparison of proposed method with other segmentation methods based on dice coefficient.

	PM	GT	HIS	SRG	CCL	NI+CCL
DT1	2788	3103	0.67	0.78	0.83	0.9634
DT2	13309	13886	0.65	0.754	0.841	0.9788
DT3	41096	42123	0.68	0.68	0.734	0.9877
DT4	7102	7258	0.7	0748	0.815	0.9891
DT5	1344	1942	0.72	0.735	0.801	0.9862

V. CONCLUSION

The Proposed algorithm utilizes the hybrid method which is the combination of NL logic along with connected component algorithm for extraction of liver and tumor. The performance of the proposed method was compared with existing strategies. Hybrid method achieved the accuracy of 98% for liver segmentation and 93% for tumor segmentation. The proposed work is mainly used to distinguish the suspicious pixels from the liver area and helps radiologists for diagnosing liver illnesses. This method also helps specialist for pulverizing the tumor pixels or cells with high power ultrasound treatment.

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Design of High Frequency Filters for RF Applications

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ABSTRACT

Filters are the significant Radio Frequency (RF) and Microwave component. It plays a vital role in RF/microwave applications especially in receiver system design. They are used to separate or combine different frequencies. Commonly lumped and distributed element filters are classified into Low pass filter (LPF), High pass filter (HPF), Band pass filter (BPF) and Band stop filter (BSF). The design and implementation of the lumped and distributed elements filter are proposed in this paper for RF applications. Low pass filter is a circuit which allows only the frequency below the cut off frequency. At the outset Low pass filter are designed using the lumped elements such as inductor and capacitor with the frequency range of 1-5GHz.The inductors and capacitors used are selected as 65.9nH, 58.5nH, 5nH and 42.7pF respectively. These specified lumped elements are not physically available. Distributed filters are the practical solution of RF filter design. Physical length and width of the inductors are 150mil and 100mil respectively. Similarly, physical length and width of the capacitors are 150mil and 50mil respectively. Numerical Analysis results with the estimation of Insertion loss as 0dB at 4GHz. High pass filter is a filter which passes only the frequency above the cut off frequency and attenuates the frequency below the cut off frequency. Here it was designed using the lumped elements with the frequency range of 1-5GHz. The value of the inductors and capacitors used are 65.9nH, 58.5nH, 5nH and 42.7pF, 60pF respectively. Corresponding physical dimension L:W of the inductors are 150mm and 100mm respectively. Similarly, physical length and width of the capacitors are 150mm and 50mm respectively. The insertion loss obtained for the High pass filter is 0dB at 2GHz. Band pass filter is a filter which passes only the desired band of frequency. As LPF and HPF, Band pass filter also designed using the lumped elements with the frequency range of 2.3-2.7 GHz. The inductors and capacitors value mentioned here is 102.618nH, 0.088nH and 0.0395pF, 45.892pF respectively. The insertion loss obtained for the band pass filter is 0dB at a bandwidth of 100 MHz finally, band stop filter are designed to eliminate the undesired band of frequencies. Here the band stop filter was designed using the same lumped elements such as inductor and capacitor with the frequency range of 1-10GHz. The value of the inductors and capacitors used are 12.214nH, 0.0769nH and 0.0819pF respectively. The insertion loss obtained for the band stop filter is 0dB at 300 MHz bandwidth. Novel Filter designs are identified and implemented for ideal RF and Microwave Applications.

Keywords : Filters, LPF, HPF, BPF and BSF

I. INTRODUCTION

FILTERS: Radio frequencies inhabited the range of electromagnetic spectrum designated communication. Filters are mean to select the signals from specific frequency bands while rejecting unwanted signals that hinder with the reception of the intended frequency. In a modern RF systems, there are more than 100 RF filters finding its application in the filtering the desire band. As the number of filters increases which intern increase the design challenge for the filter. Filter performance is important; failing design may lead to increase in power consumption and allows interference in the other hand makes RF system bulky.

II. ANALYSIS OF FILTERS

Filter analysis starts with the determination of the cut off frequency. Order of the filter plays a vital role in the ensuring the sharp cut off rate. Analysis is performed for LPF, HPF, BPF and BSP. High cut off frequency and wider bandwidth is the main goal of the design.

A. LOW PASS FILTER DESIGN:

LPF is one which permits the frequencies lower than the cut-off frequency and attenuates the frequency above the cut-off frequency. The attenuation arised in the circuit for all frequency range depends on the filter numerical solving. LPF is otherwise called a high-block filter in audio applications. The design of low pass filter involves cascading of inductance with shunt capacitance at the frequency range of 0.01-1 GHz.

$$LA(\omega) = 10\log_{10}\{1 + \varepsilon(\omega/\omega_c)^{2N}\}........(1)$$

Where,

$$\varepsilon = \{Anti\log_{10} LA/10\} - 1$$

Order of the filter N=3.

1) Numerical solving of the low pass filter:

The numerical values of the filter is calculated as given by,

$$g_0 = 1$$
,
$$g_k = 2\sin\{2k-1\}\pi/2N\}...........(2)$$

Where k=1, 2,....N and

2) The circuit model of the filter:

The numerical values of the low pass filter after frequency and impedance calculations are given by

$$c_k' = c_k / R_0\omega_c$$
$$L_k' = R_0 L_k / \omega_c \text{ Where } R_0 \text{ is } 50\Omega$$

The resulting lumped by values are given by,

$$L_1 = L_4 = 65.9nH$$
$$L_2 = L_5 = 58.85nH$$
$$L_6 = L_3 = 5nH$$
$$C_1 = C_3 = C_5 = 60pF$$
$$C_2 = C_4 = C_6 = 42.7pF$$
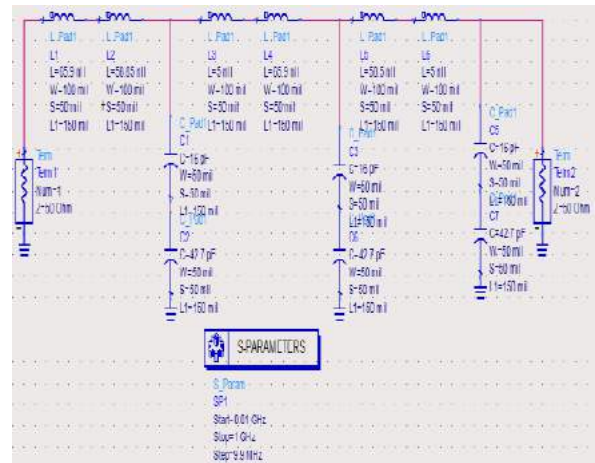
Figure1.Lumped element Low pass filter (N=3)
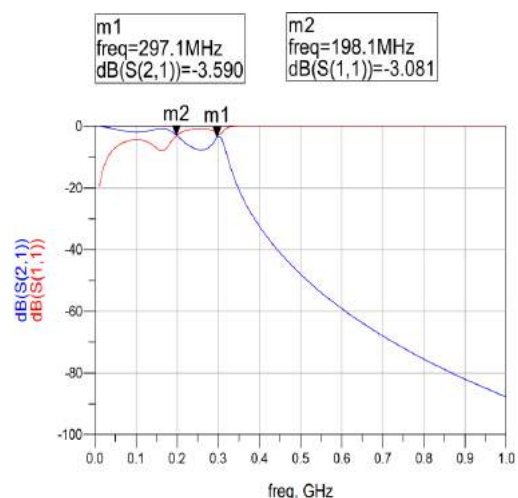
Figure2.Simulation response of lumped element circuit LPF at N=3

B.HIGH PASS FILTER DESIGN:

Generally, HPF is a filter which allows only the frequency above the cut-off frequency and attenuates the frequency below the cut-off frequency. High pass filters are designed by converting the LPF directly into HPF by changing the series and shunt elements. The value of the inductors and capacitors used are selected as 65.9nH, 58.5nH, 5nH and 142.7pF, 60pF respectively. The physical dimension of the inductors are 150mm and 100mm respectively. Similarly, physical dimension L:W of the capacitors are 150mm and 50mm respectively.

$$LA(\omega) = 10 \log_{10}\{1 + \varepsilon(\omega/\omega_c)^{2N}\} \dots\dots\dots(3)$$

Where,

$$\varepsilon = \{Anti \log_{10} LA/10\} - 1$$

Order of the filter N=3.

1) Prototype values of the low pass filter:

The prototype values of the filter is calculated by,

$$g_0 = 1,$$
$$g_k = 2\sin\{(2k-1)\pi/2N\}\dots\dots\dots(4)$$

Where k=1, 2,....N and $g_{n-1} = 1$

2) The circuit model of the filter:

The numerical values of the high pass filter is given by

$$c_k' = c_k / R_0\omega_c$$
$$L_k' = R_0 L_k / \omega_c \text{ Where } R_0 \text{ is } 50\,\Omega$$

The resulting circuit values are given by,

$$L_1 = L_4 = 65.9nH$$
$$L_2 = L_5 = 58.85nH$$
$$L_6 = L_3 = 5nH$$
$$C_1 = C_3 = C_5 = 60\,pF$$
$$C_2 = C_4 = C_6 = 42.7\,pF$$

Figure 3 Lumped element High pass filter (N=3)
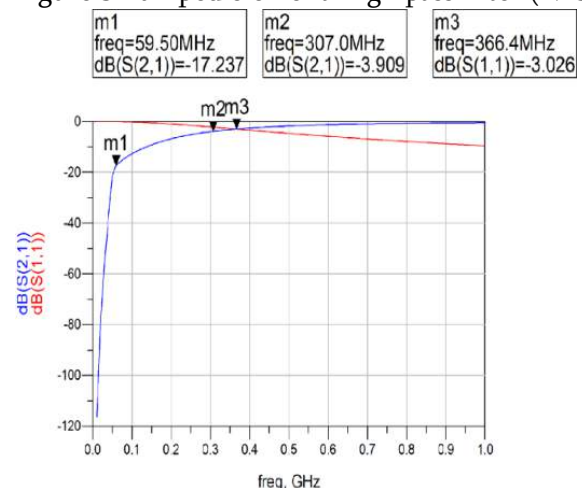
Figure 4 Simulation response of lumped element circuit LPF at N=3

From figure 4 it is inferred that the S(1,1)=Return loss=-3dB and S(2,1)=Insertion loss=-3dB for the cut off frequency 307MHz.

C BANDPASS FILTER DESIGN:

Band pass filter is a filter which passes only the desired band of frequency and it is a combination of both high pass filter and low pass filter. As HPF and LPF, Band pass filter designed using the lumped elements with the cut off frequencies of 2.3-2.7GHz. The inductors and capacitors value are selected as 102.618nH, 0.088nH and 0.0395pF, and 45.892pF respectively.

1) Specification of Lumped model of the filter:

Lower cut-off frequency : 2.436GHz
Upper cut-off frequency : 2.556GHz
Band width : 0.1GHz

Order of the filter : 2

2) The circuital model of the filter:

The numerical values of the band pass filter after frequency are given by

Where, Z_0 is $50\,\Omega$

$$L_1' = L_1 Z_0 / \omega_0 \Delta \dots \dots (5)$$

$$C_1' = \Delta / L_1 Z_0 \omega_0 \dots \dots (6)$$

$$L_2' = \Delta Z_0 / \omega_0 C_2 \dots \dots (7)$$

$$C_2' = C_2 / Z_0 \Delta \omega_0 \dots \dots (8)$$

$$L_3' = L_3 Z_0 / \omega_0 \Delta \dots \dots (9)$$

$$C_3' = \Delta / L_3 Z_0 \omega_0 \dots \dots (10)$$

$$\Delta = (\omega_2 - \omega_1) / \omega_0 \dots \dots (11)$$

The resulting lumped values are given by:

$$L_1' = L_2' = L_3' = 102.618\,nH$$

$$L_4' = L_5' = 0.08879\,nH$$

$$C_1' = C_2' = C_3' = 0.0395\,pF$$

$$C_4' = C_5' = 45.8926\,pF$$

The schematic window of the lumped element band pass filter is shown in the figure 5.
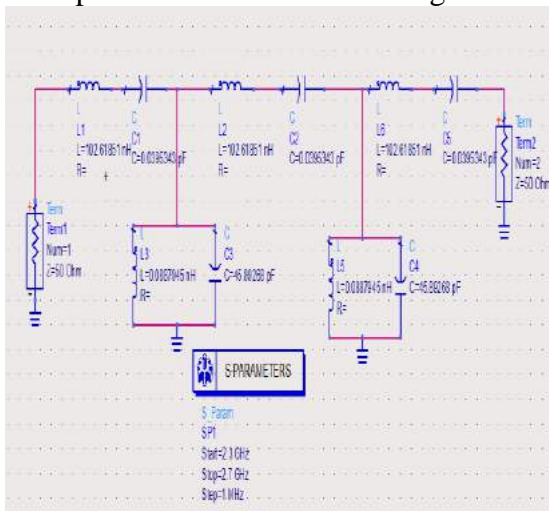
Figure 5 Lumped element Band pass filter

Fig. 6 shows the simulation result for N=2 of lumped element BPF. The return loss, S (1,1)= -4dB and Upper cut-off frequency 2.4 GHz, Lower cut-off frequency 2.5GHz.Hence bandwidth can be obtained as 0.1 GHz
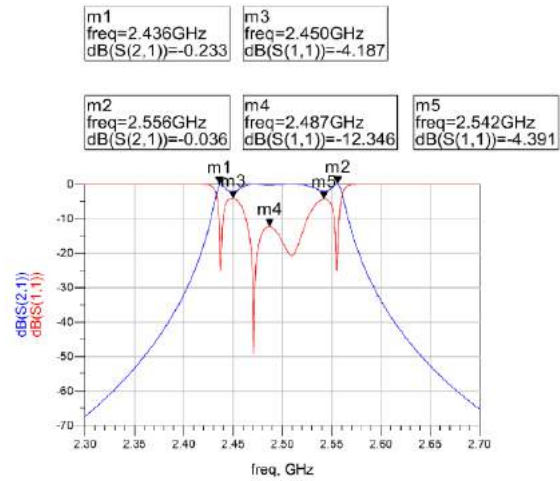
Figure 6 Simulation response of lumped element circuit BPF at N=2.

D BAND STOP FILTER

Band stop filter or band reject filters are designed to eliminate the undesired band of frequencies. Here the Band stop filter was designed with the frequency range of 1-10GHz to make is predominant in RF applications. The value of the inductors and capacitors used are selected as 12.214nH, 0.0769nH and 0.0819pF respectively.

1) Specification of Lumped model of the filter:

Lower cut off frequency : 4GHz

Upper cut off frequency : 6GHz

Band width : 2GHz

Order of the filter : 2

2) The Lumped model of the filter:

The lumped values of the band stop filter after frequency calculations done are given by

$$\omega_0 = \sqrt{\omega_1 \omega_2} \dots \dots (12)$$

$$FBW = (\omega_2 - \omega_1) / \omega_0 \dots \dots (13)$$

$$C_P = (1 / FBW \omega_0 \Omega_C) 1 / \gamma_0 g \dots \dots (14)$$

$$L_P = (\Omega_C FBW / \omega_0) \gamma_0 g \dots \dots (15)$$

$$L_S = (1 / FBW \omega_0 \Omega_C) \gamma_0 g \dots \dots (16)$$

$$C_s = (\Omega_c FBW / \omega_0) 1 / \gamma_0 g \dots \dots (17)$$

The resulting lumped values are given by:

$L_1{'}= L_4{'} = 12.2124\,nH$

$L_2{'}= L_5{'} = 0.0764\,nH$

$L_3{;}{'}= L_6{'} = 12.2124\,nH$

$C_1{'}= C_4{'} = 0.0819\,pF$

$C_2{'}= C_5{'} = 0.0819\,pF$

$C_3{'}= C_6{'} = 13.0075\,pF$

The schematic diagram of the lumped element band stop filter is shown in the figure 7.
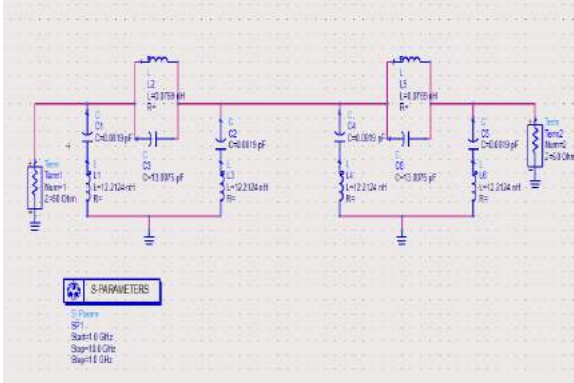
Figure 7 Lumped element Band stop filter (N=2)
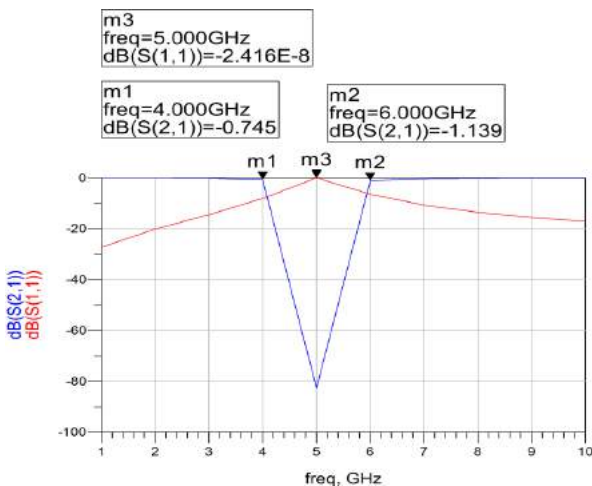
Figure 8 Simulation response of lumped element circuit BSF at N=2.

Fig. 8 shows the simulation result for N=2 of lumped element BSF. The return loss, S(1,1)=-2dB and Upper cut-off frequency 4 GHz, Lower cut-off frequency GHz. Hence bandwidth can be obtained as 2GHz

III. CONCLUSION

The numerical designing of lumped elements based filters like LPF, HPF, BPF and BSF are executed for RF frequencies. The theoretical calculation derived and found good agreement with the numerical simulation results. This paper explains the procedure for designing and numerical solving using ADS tool. It is also possible to generate layout of the above said filters using ADS tool and fabricate the same.

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Social Media-Its Impact on Employee Engagement

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ABSTRACT

In Contemporary Business world of increased expectations, growing influence of social media and networking, companies find new ways to engage the workforce. Organizations finally became serious to integrate social technologies into recruitment, development and engagement practices. At present social integration is the status quo of all organizations. Employee engagement is a workplace approach designed to ensure that employees are committed to their organization's goals and values, motivated to contribute to organizational success, and are able at the same time to enhance their own sense of well-being. Using social media business creates an environment of collaboration.

Employee engagement is important for the success of any organization when transforming into the digital age. It is important to consider the level of engagement as competitive advantage and value proposition for organization. Internal social media applications provide employees with an easy way to communicate and share personal and professional information with other co-workers.

Keywords : Social Media, Employee Engagement

I. INTRODUCTION

The era of social media started in 1997 on its first popular site called SixDegree.com allowing users to create personal profiles and a friends list online (Boyd & Ellison, 2007) followed by blogging platforms like Blogger and Live Journal in 1999 and the rest such as Wikipedia in 2001, Myspace in 2003, etc . Technologies widely grew, social media has moved quickly from the tech-savvy domain to the mainstream (Shirky, 2008) penetrating into organizations at a rapid pace. A survey done by McKinsey reported that 65% of organizations use social media based technologies to motivate and enhance performance (Bughin & Chui, 2010).

In 2013, organizations finally became serious to integrate social technologies into recruitment, development and engagement practices. At present social integration is the status quo of all organizations. Employee engagement is a workplace approach designed to ensure that employees are committed to their organisation's goals and values, motivated to contribute to organisational success, and are able at the same time to enhance their own sense of well-being.

David Macleod (2009) describes employee engagement as "How we create the conditions in which employees offer more of their capability and potential." An 'engaged employee' is one who is fully involved in, and enthusiastic about his work, and thus will act in progress of his organization's interests. The positive attitude and energy from an engaged workforce pays dividends in employee retention and attraction of top talent.

Employee engagement is a key business driver for organizational success. It helps to differentiate the organizations, and with high level of employee engagement, firms can promote retention of talent, foster customer loyalty and improve organizational performance and stakeholder value. Employee engagement is influenced by many factors-from workplace culture, organizational communication and managerial styles to trust and respect, leadership and company reputation.

Social Media: Online networks and two-way communication channels connect users in the virtual world, establishing new relationships that expand users' networks and facilitate user participation in interactions and exchanges. Social Media has become an integral part of the way we live and work. Social media comes with great advantages to teams, individuals, and the collective knowledge of an organization. Companies agree that social networking has become an integral part of the business world.

Employers who acknowledge the need for social interaction in the workplace offer internal social media platforms, called enterprise social networks, to channel the need for social activity. An enterprise social network is an exclusive network only accessible to the business and its internal users. An enterprise social network meets company and employee needs to be engaged. Users can share thoughts, photos, updates, and more without leaving the work environment. According to a Microsoft survey of 9,000 workers across 32 countries, 31 percent would be willing to spend their own money on a new social tool if it made them more efficient at work.

II. NEED FOR THE STUDY

Literature review indicates that there is lack of empirical research done on impact of social media on employee engagement. Use of the internet and social media has grown substantially over the last decade, and the use of these new web-based technologies for work related activities has been a major part of that. Among employees, 61 per cent make use of the internet at work, spending on average seven hours a week online at work (Dutton Helsper & Gerber 2009).

An enterprise social network makes it easier for employees to do their work—by collaborating, communicating, sharing, giving feedback, suggesting, questioning, and recommending. It helps employees to be more engaged in the business and see more of the big picture. It is known that employees who are engaged at work provide their customers better service, are more productive, and are more likely to stay with the company.

Internet and mobile Association of India (IAMAI)came out with the report (source: Economic Times, Nov 18 2015) that India will have second largest internet user base by Dec 2015 overtaking US by 402 million internet users and presently Indians are very active on different social networks with 88% of users spending time on various social networking sites.

Hence there is a need to study the impact of social media on employee engagement and it will eventually contribute towards the productivity in both manufacturing and service sectors.

III. Research Methodology

This paper is mainly descriptive in nature and the data is gathered from secondary sources. Data is gathered from many sources like Newspaper (Both Local & National), Magazines, Research data.

Objectives of the study:

To Understand how social media is used for employee engagement

To understand the role of social media in organizations

IV. LITERATURE REVIEW

A. Social Media

According to Kaplan & Heinen (2010), as cited in Majchrzak, Faraj, Kane, & Azad (2013), social media is "a group of Internet-based technologies that allows users to easily create, edit, evaluate, and/or link to content or to other creators of content" (p. 38). Li and Bernoff (2011) say the groundswell created by social media has changed the balance of power by creating a scenario where individuals have the power to undermine the communication efforts of organizations (p. 13). Kaplan and Haenlein, (2010) state that the platforms of this large group of applications can be categorized on the basis of two aspects – 'Media richness' and 'Social presence'. Social media is a means for social interaction, as a superset beyond the natural social communication. As enabled by the existing and expanding communication techniques, social media have changed substantially communication between both organizations and individuals Kietzman et al, (2011); Henricks, 2009).

Social media started as a way for people with similar interests to get to know one another and interact. One of the earliest sites that could be considered social media was MUD or Multi-User Dungeon (the "D" could also stand for Dimension or Domain) and it was a place for those interested in role-playing games to interact with each other and chat Edosomwan, Prakasan, Kouame, Watson, & Seymour, (2011).

Leonardi, Huysman, & Steinfield (2013) define enterprise social media as a "web-based platform that allows workers to communicate messages with specific co-workers or broadcast messages to everyone in the organizations; explicitly indicate or implicitly reveal particular co-workers as communication partners; post, edit, and sort text and files linked to themselves or others; and view the messages, connections, text, and files communicated, posted, edited, and sorted by anyone else in the organization at any time of their choosing" (p. 2).

B. Employee Engagement

Kahn (1990) was the first to suggest that employee engagement would positively impact on the Organisation's outcome. The reasoning behind his contention was that because employees want to work for reasons other than "they get paid to do it", they will work to pursue success for their organisation. Research by Gallup has found low to moderate correlations between employee engagement and a range of outcome measures, including customer satisfaction, profit, productivity, turnover and safety Harter et al, (2002). Research consistently shows that low levels of employee engagement are detrimental to performance. In fact, it has been found that employees that are highly engaged are twice as likely to be top performers Taleo Research, (2009).

A workplace approach designed to ensure that employees are committed to their organisation's goals and values, motivated to contribute to organisational success, and are able at the same time to enhance their own sense of well-being." MacLeod and Clarke, (2009 pg. 9). Findings from the 2011 WERS were released in 2013 Van Wanrooy et al (2013), a survey was conducted and found out that engagement is enabled by factors such as discretionary effort, loyalty, and job satisfaction.

In 2009, Harter et al. conducted a meta-analysis encompassing 199 research studies across 152 organisations in 44 industries and 26 countries. They statistically calculated the available data on business/work unit level relationship between employee engagement and performance outcomes within in each study. The studies covered 32,394

business/work units and 955,905 employees Harter et al. (2009). Their findings quantified significant differences between business units ranking in the top and bottom 25% on engagement. They found an 18% drop in productivity between the top and bottom performers. Additionally, there was a 60% drop in quality (measured by defects in products). In a similar study into Fortune 100 companies, it was found that there was a dramatic 1,000 percent increase in errors among disengaged versus engaged employee populations Gonring, (2008).

Engaged employees are less likely to leave their job. If an employee has no emotional commitment to their job, there is a greater chance that they will leave to pursue a job that offers, for example, higher remuneration or more flexible work conditions Haid & Sims, 2009; Schaufeli & Bakker, (2004). The Corporate Leadership Council (2004) found that the most engaged employees are 87% less likely to leave their organisation. Organisations enjoy 26 percent higher revenue per employee when employees are highly engaged Taleo Research, (2009). Engagement is most closely associated with the existing construction of job involvement Brown (1996) and flow Csikszentmihalyi, (1990). Job involvement is defined as 'the degree to which the job situation is central to the person and his or her identity Lawler & Hall, (1970). As Purcell explains, "engagement is a combination of attitude and behaviour. The attitude is 'commitment', and the behaviour is 'going the extra mile" Purcell,(2010)

C. Social Media and Employee Engagement

Social Media can also be thought of as the "media which is primarily used to transmit or share information with a broad audience. Social networking is an act of engagement as people with common interests associate together and build relationships through a community" Cohen, 2009; Hartshorn, (2010); Edosomwan et.al. (2011, p. 83).

Social media has the potential to achieve employee engagement, enhance productivity and increase collaboration, C. J., Davison, R. M., Zhong, X., & Liang, Y.,(2010). APCO Worldwide and Gagen MacDonald jointly sponsored an online survey on employee engagement and found out that 63% used Internal social Media (ISM) in workplace such as wikis, blogs or internal community sites and it helped demonstrating innovation, stay connected with others and likely uphold company's brand and reputation.

Gigi G. S. and Dr. P. Umarani (2013) stated that employees' voices can be a very powerful medium across the various social platforms. Empowering and engaging them to speak on behalf of an organization can be a fruitful endeavour for both the company synergy efforts as well as its social strategy. Social media can be utilized as an internal communication tool to engage with both existing and potential employees, Parry and Solidoro (2013).

Shilpa Roy P (2013) states that Social Media Usage helps leaders share experience, provides opportunity to generate new ideas, people feel more connected and increases employee engagement. Bob Kelleher (2013) Social media is a huge engagement, staffing, retention, and increasingly, branding tool, companies use social media to link both product and employment brand, and to get their customers to sing their praises or live their brand. Erin Dick, Manager (2011), of Health & Wellness discussed in Employee Engagement conference; that using social media and other leading-edge engagement strategies can drive performance, productivity and bottom line results linking social media and wellness programs to improve employee engagement.

Private (enterprise) social networking sites are IBM's Beehive and HP's Watercooler system Leonardi,

Huysman, & Steinfield, (2013). IBM's Beehive is an enterprise social media for the use IBM employees. The site allows for employees to develop profiles, search for other people, interact with other employees by commenting on content, share content such as photos, and even RSVP to events organized through the site Lee & Xue, (2013).

The work of Michael Brzozowski in the year (2009), describes Water Cooler, a tool that aggregates shared internal social media and cross-references it with an organization's directory. They also deployed the WaterCooler in a large global enterprise and present the results of a preliminary user study which reveal that - WaterCooler changed users' perceptions of their workplace, made them feel more connected to each other and the company, and redistributed users' attention outside their own business groups.

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Figure 1. Examples of social collaboration tools that can be used to engage employees

Social tool categories	Social media tool examples
Micro blogging A form of blogging where users post short updates or messages in chronological order. Often in enterprises, this could be done for a defined network or group, or the entire organization. Core to blogging and microblogging is the ability to comment on and add to another's posts, providing a richer conversation.	▶ Yammer ▶ Jive ▶ Connections
Media sharing: photo and video sharing Allows users to upload and share videos and photos for publishing to a network. Within an organization, this is often used company-wide or within groups. Many media-sharing capabilities can be found in broad enterprise collaboration platforms such as Sharepoint.	▶ Animoto ▶ YouTube ▶ Vimeo
Polling Online audience polling tools that show immediate results to a virtual audience. Many services now allow users to respond to polls using text messaging and smart devices.	▶ Poll Everywhere ▶ Yammer
Communities Social software platforms are primarily designed for building a collaborative culture using content defined by the employees. Enterprise social platforms typically allow networks and individuals to create online communities and working groups, providing a space for content or purpose-specific collaboration and social networking, e.g., project management community or a new hire community.	▶ Jive ▶ Connections ▶ SharePoint
Visualization tools Provide techniques to turn content and data into meaningful graphics.	▶ Wordle ▶ Tagxedo ▶ Easley ▶ Storyline
Ideation Provides a platform for wide spread idea sharing, often called crowdsourcing, and collaborative dialogue to produce ideas greater than the original. Typically, an organizational challenge is presented to provide a high-level structure for which ideas are shared. When used in a time-boxed manner, these idea management sessions are often referred to as "sprints."	▶ ThinkTank ▶ IdeaJam ▶ Spigit

V. CONCLUSION

In today's World which is fact paced where multimedia is much used in the workplace, engaging employees in transformation programs through traditional methods will no longer suffice. Working population is more engaged with social media, companies must keep pace or lose a valuable opportunity to gain insight, innovation and feedback. Research and case studies have shown, the use of social media in change programs can play a vital role, not only in realizing the promise of major change initiatives, but also in creating a more engaged and productive workforce

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Effect of flux (NH4Cl)on Y2SiO5:Dy3+ (9 mol %) nanophosphors its Characterization and Structural studies

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ABSTRACT

Flux (NH$_4$Cl) doped on Y$_2$SiO$_5$:Dy^{3+} phosphors were synthesized by auto ignition based low temperature Solution Combustion Synthesis (SCS) using ODH as fuel. Powder X-ray diffraction (PXRD) patterns confirm the nano sized particles corresponding to JCPDS card 36-1476. The crystallite size of the samples estimated from Scherrer's formula. SEM micrographs infer addition of flux gives the enhanced grain growth and it attains smooth surface improves the crystallinity and particle morphology of the sample. FTIR data reveals the presence of M-O bonds and Y-O bonds.

Keywords—Flux, combustion, FTIR and SEM

I. INTRODUCTION

White light emitting diodes (LEDS) are given much importance because of their unique properties like low consumption, luminescence efficiency and long life time [1-3]. Addition of flux has several advantages like reducing the processing temperature, increases the luminescence properties as the flux material has low melting point than the solution combustion reaction temperature [4]. This results the material with good crystallinity, particle size distribution. In the present work the effect of various flux namely NH$_4$Cl on the Y$_2$SiO$_5$: Dy^{3+} (9mol %) nanophosphor its characterization, morphology are studied. The flux is named as NH$_4$Cl –flux 1. The purpose of this work is to investigate the role of flux on the phase formation, surface morphology so that it can be used for further studies.

II. EXPERIMENTAL

A Synthesis

The phosphors were prepared by combustion method. For the synthesis of phosphors, 0.027g of Dy$_2$O$_3$ and 1.109g of Y$_2$O$_3$ were taken initially as raw materials to which 1:1 HNO$_3$ is added. This aqueous solution was heated on a sand bath to remove the excess HNO$_3$. To this transparent solution 0.3g of SiO$_2$, 0.04308g of NH$_4$Cl and 1.77g of ODH are added. This mixture is kept in muffle furnace at a temperature of $\sim$ 500°C which undergoes combustion reaction. The obtained product is calcined at 1300 °C for 3h.

0.027g Dy$_2$O$_3$ + 1.109g of Y$_2$O$_3$ → 0.3g SiO$_2$+ 0.04308g of NH$_4$Cl + 1.77g of ODH--(1)
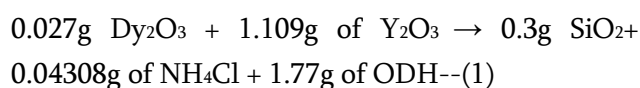
B Instruments

The important information like lattice parameter, crystallinity of the sample, average crystallite size,

PanalyticalX'Pert pro MPD CuKα (1.541 Å) with nickelfilter. To study the morphology of the samples and to know about the dependence of flux on topography Scanning electron microscopy (SEM) Jeol JSM 7500F Field emission scanning electron microscope is used. In the present work we used Perkin Elmer FTIR spectrometer to study FTIR analysis of the prepared samples.

III RESULTS AND DISCUSSION

A Phase identification of Y_2SiO_5: Dy^{3+} doped with flux1

Phase purity of various flux synthesized samples were investigated by XRD analysis. Fig.1 illustrates the XRD patterns of zero flux and flux1 together with stacked plot of standard pattern of JCPDS card number 36-1476. The diffraction patterns are consistent with the standard data
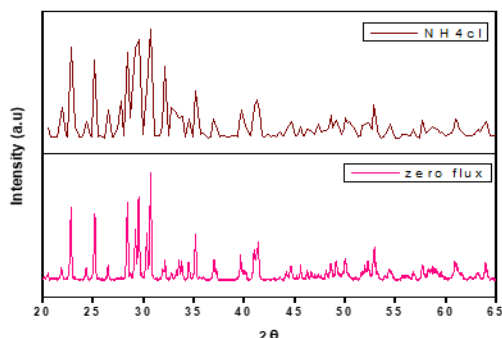
Fig.1 PXRD patterns of different fluxes used in Y_2SiO_5: Dy^{3+} (9 mol %) nanophosphor

which indicates that prepared phosphors are well matched with pure monoclinic phase Y_2SiO_5:Dy^{3+} phosphors. Adding of flux1 (NH4Cl) to the phosphor results in lower phase transformation as flux 1 has decomposition reaction at quite lower temperature and due to this effect plays key role for the cleaning effect of the surface particles. This improves the reaction reactivity and further lowers the synthesis temperature of the samples [5].

B FT-IR Analysis

FT-IR absorption bands of the zero flux, flux 1 (NH4Cl) used in Y_2SiO_5:Dy^{3+} (9 mol %) nanophosphors recorded are shown in the Fig.3. For zero flux the bands at 593 cm^{-1} can be attributed to Y-O stretching vibrations and the bands > 800 cm^{-1} can be attributed to the Si-O bands. Similarly for flux 1 the bands at 599 cm^{-1} are attributed to Y-O stretching bands, bands at 841 cm^{-1} and 881 cm^{-1} are the characteristic of M-O bands. The bands above 900 cm^{-1} are due to the Si-O vibrations.
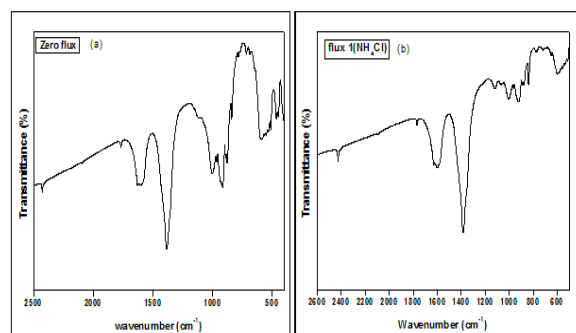
Fig.2 Fourier transform infrared spectra of the (a) zero flux, (b) flux 1 (NH4Cl) used in Y_2SiO_5:Dy^{3+} (9 mol %) nanophosphors

C SEM &EDAX

Surface morphology of the prepared phosphors were analyzed by the SEM shown in the Fig.4. The SEM micrographs in Fig.4 (A) and (B) were recorded with magnification 1μm for zero flux and flux 1 samples respectively. The sample for zero flux has agglomeration, with particle size ~ 159 nm, after introducing flux the number of voids increase for flux 1 shown in Fig.4(B). As the melting point of all the flux i.e., flux 1 (NH4Cl - 338℃) is less than the solution combustion synthesis reaction temperature (450 ℃) this results in melting of flux components there by diffuses into the host reaction region. In the calcining

process the melting of flux will eliminate the solid-solid grain boundaries and makes the particles to form a smooth surface [6].
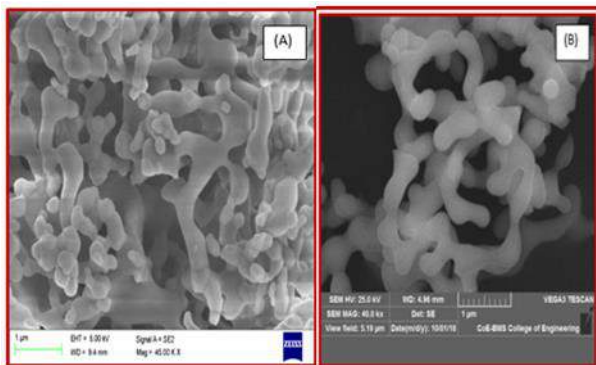
Fig.4 (A) and (B), SEM Micrographs of (magnification 1μm) zero flux and 1 (NH$_4$Cl) used in Y$_2$SiO$_5$:Dy^{3+} (9 mol %) nanophosphors.

IV CONCLUSIONS

To improve the luminescence properties of prepared Y$_2$SiO$_5$:Dy$_x^{3+}$ phosphors were doped with flux like NH$_4$Cl. It is observed that effect of flux is dependent on XRD, morphology. From XRD data it is observed that effect of flux influence the host by broadening of the peaks and hence it results small crystallite size ~ 20 nm – 22 nm. SEM morphology has agglomeration before adding flux and after adding flux found to have smooth surface as the melting of flux eliminates solid-solid grain boundaries and makes the particles to form a smooth surface [6,7].

ACKNOWLEDGEMENTS

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ELECTROCHEMICAL PROPERTIES OF COBALT DOPED GdAlO3

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ABSTRACT

Nanocrystalline $GdAlO_3$: Co^{2+} is synthesized by combustion process. The XRD study shows that the nano powder is single phase with orthorhombic structure and belongs to the space group Pnma. The DRS spectrum analysis reveals that the material is a wide band gap material with band gap of about 4.4 to 4.9 eV. The electrochemical properties of the $GdAlO_3$: Co^{2+} was measured using cyclic voltammetry (CV) The CV studies clearly indicate that Co^{2+} dopant was successful doping material due to increasing the reversibility by reducing the E_O-E_R value of the electrode reaction.

Keywords— Combustion method; DRS; cyclic voltammetry; electrochemical impedance spectroscopy

I. INTRODUCTION

Presently energy is a fundamental worldwide issue for the human society, what we needed energy is provided by the fossil fuels, But it is not renewable and it emits pollutants while burning which degrade the environment and greenhouse gases, which lead to a global warming problem [1-2]. Such frameworks require the advantages of compactness and energy effectiveness while being environmental friendly [3]. The technology and systems of an external thermal interface or that of an external electrical interface embrace by Energy conversion and storage systems [4]. Based on amount of energy and power available for the load they are categorised into groups which includes batteries, fuel cells, capacitors and supercapacitors [5-6].

Nanotechnology is a growing area of research, primarily due to its numerous applications in engineering/science. Therefore, the synthesis of new nanomaterials and improving its properties are of current research interest to many researchers. It has been found that the physical properties of individual nanoparticles can be very different from those of their bulk counterparts [7]. Rare earth compounds have been extensively used in high performance luminescent devices, magnets, catalysts, and other functional materials because of their electronic, optical and chemical characteristics resulting from the 4f shell of their ions [8-10]. These properties depend strongly on the material composition and structure, which are sensitive to the bonding states of rare earth ions.

Compounds having perovskite-type structure as denoted by ABO_3 have drawn scientific interest for many decades due to wide range of applications, such as magnetic, optical, ceramics, and catalysis [11]. In this paper the synthesis of nano $GdAlO3:CO^{2+}$ perovskite by the modified combustion method is studied. Its structural characterization, optical properties and cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) are also studied.

II. EXPERIMENTAL

A. Preparation of sample

$GdAlO3:CO^{2+}$ (1,3&9 mol %) synthesised using the solution combustion method by using stoichiometric quantities of gadolinium nitrate [Gd $(NO_3)3$], aluminium nitrate (Al $(NO3)2$, cobalt nitrate CO $(NO_3)2$, laboratory prepared Oxalyl dihydrazide (ODH:$C_2H_6N_4O_2$) fuel were dissolved in doubled distilled water. A homogeneous solution obtained after stirring 15min. The resultant solution was placed in a furnace pre heated at400°C for, until surplus free water evaporated and natural ignition occurred ensuing in a fine powder product obtained after grinding. Finally, the as prepared powders were calcined at 1000°C for 3 h. The resulting $GdAlO_3:CO^{2+}$powder were cooled down to room temperature and mixed well by using a pestle and mortar [12].

B. Preparation of the modified electrode

The sample, graphite powder and silicone oil ratio was 15:70:15 % by weight and were mixed in an agate mortar for about 40 min. the carbon paste was packed in to the of the Homemade carbon paste electrode and then smoothened on a tissue paper till the surface become uniform.

III. RESULTS AND DISCUSSION

A. PXRD Analysis

The XRD pattern of 1000 °C calcinated combustion product indicate that fully crystallized single phase $GdAlO3:CO^{2+}$ were obtained as shown in the Fig 1. All the peaks in the XRD pattern are in good agreement with JCPDS File No. 46-0395 [13], demonstrating the formation of GdAlO3 phase with orthorhombic perovskite structure indicates that all the dopants($CO2+$) have successfully been incorporated into the host matrix(GdAlO3). The effect of crystallinity on the crystallite size of the samples crystallite size (D) was estimated from the line broadening in X-ray powder using Scherrer's formula [14].

$D=K\lambda\beta\cos\theta$

Where, 'K'; constant,λwavelength of X-rays, and θ; FWHM was found to be in the range 15-25 nm
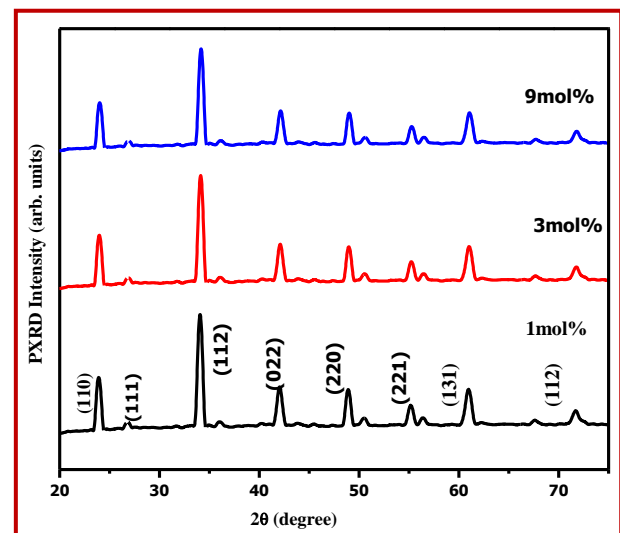
Fig 1. PXRD patterns of GdAlO3:CO^{2+}

B. Optical studies

In the optical studies, diffuse reflectance spectra were measured and band gap calculated from diffuse reflectance spectra. A sharp band at 280 nm and week absorption band at 215 nm was observed for the samples as shown in Fig. 2. The maximum absorption arises due to transition between valence band to conduction band. The weak absorption in the UV–visible region is expected to arise from transitions involving extrinsic states such as surface traps or defect states or impurities [15]

Band gap is calculated for the GdAlO3:Co^{2+} sample based on Kubelka Munk theory [15-18]. The plot of $(F(R)h\nu)^2$ versus hν, the value of E_g was obtained by extrapolating the linear fitted regions to $(F(R\infty)h\nu)^2=0$. The curve of Fig. 3 exhibits nonlinear and linear portions, which is the characteristic of direct allowed transition. The nonlinear portion corresponds to a residual absorption involving impurity states and linear portion characterizes the fundamental absorption. The band gap of different mol concentration of Co^{2+}doped GdAlO3 is found in the range of 4.4 to 4.9 eV.
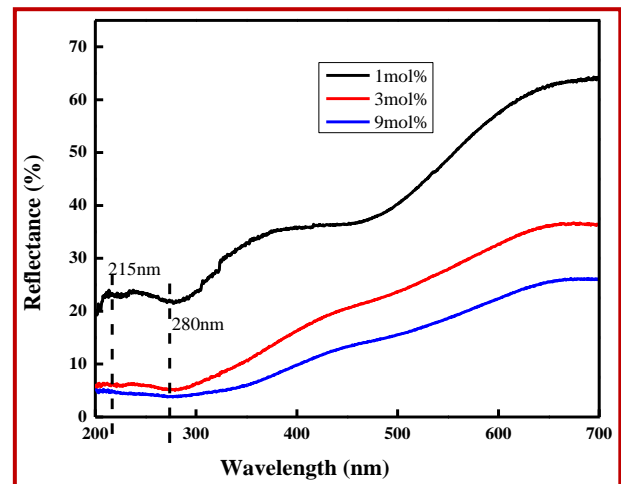
Fig.2. Diffuse Reflectance Spectra of Co^{2+} doped GdAlO3.
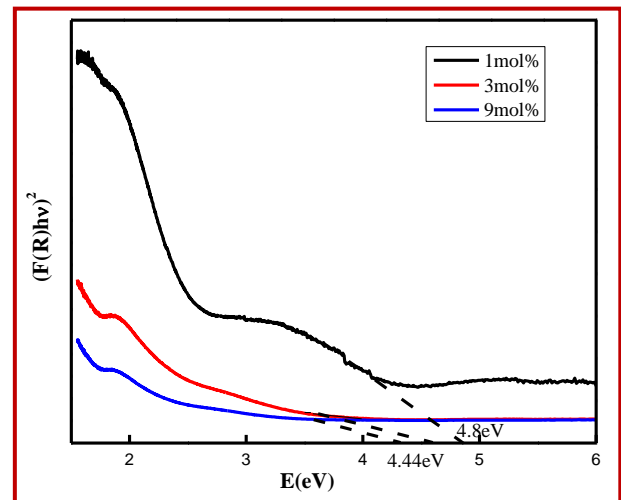
Fig.3 Band gap values of Co^{2+} doped GdAlO3.

IV. CYCLIC VOLTAMMETRY

Electrochemical tests, including cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were performed, in this study; all of the electrodes were tested in aqueous 1M KOH electrolyte using a three electrode system. Fig.4 exhibits cyclic voltammetry curves obtained at different scan rate (10, 20, 30, 40 & 50 mV s^{-1}) in 1M KOH electrolytes.

Cyclic voltammograms (CVs) analysis used for understand the electrochemical performance of Co^{2+}

doped GdAlO₃ electrode for super capacitor during charging and discharging processes. In order to understand the effect of various mol concentrations on the electrochemical performance of GdAlO₃: Co²⁺ nanophosphors carbon paste electrodes, the CV experiments were conducted for the electrodes with different mol concentration. [19].

The quantification of charge efficiency, charge-discharge of electrodes and the reversibility of the electrode reaction were carried out using cyclic voltammetry. The reversibility of the electrode reaction was measured by taking into account the difference between the oxidation potential (E$_O$) and the reduction potential (E$_R$) [20] at 10 mV/s scan rate. Smaller the value of E$_O$-E$_R$, more reversible was the electrode reaction. Hence, with the addition of Co²⁺, a phenomenal increase in the reversibility of the electrode reaction was noted at 3 mol % of Co²⁺ and there is no drastic change of reversibility of electrode material due to doping of Eu³⁺, the E$_O$-E$_R$ values of Co²⁺ doped GdAlO₃ are given in the Table 1
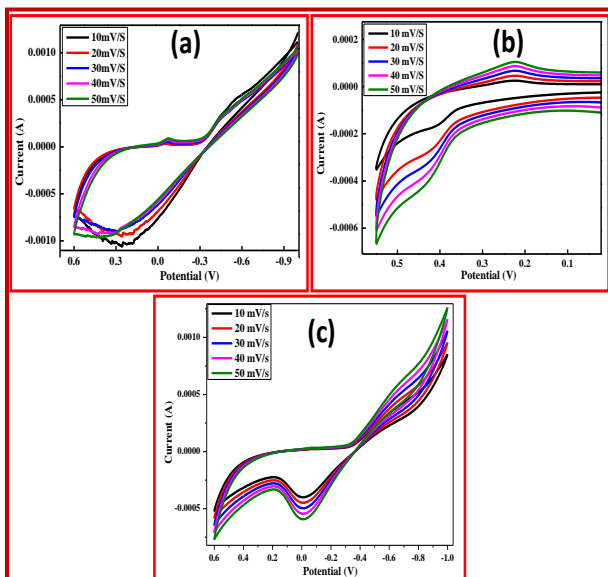
Fig.4 Cyclic voltammogram of Cobalt doped GlAlO₃ in 1M KOH electrolyte. (a) GdAlO₃:Co²⁺ (1 mol %) (b) GdAlO₃:Co²⁺ (3 mol %) (c) GdAlO₃:Co²⁺ (9 mol %).

Table 1 Oxidation potential (E$_O$), reduction potential (E$_R$), the difference between E$_O$ and E$_R$ and diffusion co-efficient of GdAlO₃:Co²⁺ electrodes

Co²⁺ Concentration mol%	E$_O$(V)	E$_R$(V)	E$_O$-E$_R$(V)	Proton diffusion coefficient (D), cm²S⁻¹
1	0.2332	-0.0779	0.3244	1.369×10^{-5}
3	0.4129	0.2237	0.1892	2.0356×10^{-4}
9	-0.1185	-0.3739	0.2553	1.4807×10^{-5}

Further, the peak currents of GdAlO₃:Co²⁺ show that oxidation increase with the increase of scan rates and the peak potentials almost have no change. The anodic peak currents are linearly proportional to the square root of scan rates as observed in Fig. 5 which suggests that the electro catalytic oxidation of GdAlO₃:Co²⁺ on platinum electrode is a diffusion-controlled process. The hydrogen diffusion co-efficient of the samples are shown in Table 6.2 which is calculated using slope of the fitted line. The hydrogen diffusion co-efficient value is high as compared with previous report by E. Shangguan et al. (6.81×10^{-10}cm² s⁻¹), B. Shruthi et al. (1.44×10^{-12}cm² s⁻¹) [21-24].
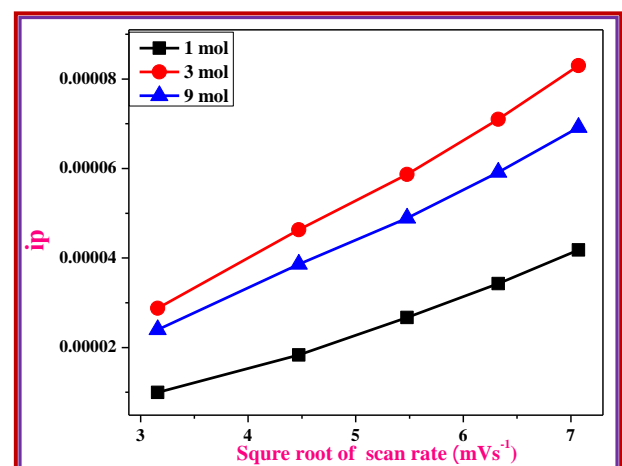
Fig. 5 Relationship between the cathodic peak current (Ip) and the square root of the scan rate for Cobalt doped GlAlO$_3$.
(a) GdAlO$_3$:Co^{2+} (1 mol %) (b) GdAlO$_3$:Co^{2+} (3 mol %) (c) GdAlO$_3$:Co^{2+} (9 mol %).

V. CONCLUSION

The structure were analyzed by PXRD CV studies clearly indicate that Co^{2+} dopant was successful doping material increasing the reversibility by reducing the E_O-E_R value of the electrode reaction. . The hydrogen diffusion co-efficient value is high as compared with previous report. The electrode reaction has a larger exchange current density and thus during charge discharge process the active material of electrode reaction will be fully used and exhibit higher utilization of active material and larger discharge capacity.

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Microcrystalline Properties of PVA/Co3O4 Nanocomposites

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ABSTRACT

The whole pattern fitting was used to compute microcrystalline properties of Cobalt Oxide nanoparticles blended PVA/Co_3O_4/NaCl nanocomposite thin films of different weight percentage concentration.

Keywords : Solution Combustion, Cobalt Oxide nanoparticles, XRD

I. INTRODUCTION

Solution combustion synthesis (SCS) is a an effective, and expeditious method for the synthesis of scalable, highly pure, ordered crystalline metal oxide nanoparticles. Solution combustion synthesis has been widely explored as a flexible, straightforward and expeditious method for the metal oxide nanoparticles synthesis. Combustion synthesis provides equivalent molecular amalgamation, large extent of homogeneity and curtailed reaction time that prompts decreased crystallization temperature hindering aggregation [1,2]The pronounced properties of materials are vigorously affected by the microstructure. Moreover, microstructure is an intricate aspect with very different features which regularly depend on the method of investigation. The different properties of nanostructured materials are attributed to the structural imperfections of these materials. The methodical evolution of nanostructured materials rely upon the elucidation of material disposition in terms of detailed study of lattice imperfections. Enhanced conductivity of intrinsic semiconductors, strength of crystals, crystal growth, elastic properties and luminescence properties are attributed to the defects in crystals. In essence the real crystal is always idealistic and crystal imperfections are pragmatic. Basically there are three kinds of imperfections that can materialize in crystals: point defects, line defects, and plane defects.

Conventional line profile analysis methods [3-5] are based on approximate equations to relate line broadening to lattice distortions and diffraction domain size with simplifying assumptions. In recent times, a reasonable improvement has been the prelude of analytical functions to fit diffraction profiles, leading to the development of the defect characterization methods [6-7]. WPPF technique allows a simultaneous processing of the entire XRD profiles using established models of domain size/shape and defects, rather than hypothetical models .

The formation of high performance Nano composite materials based on a polymeric matrix with some inorganic salt spacers and nano fillers results in a new functional material which exhibits significant improvement in material properties [8-9]

Here we report the computation of microcrystalline properties of PVA/NaCl/Co₃O₄ nanocomposites using Line profile analysis

II. EXPERIMENTAL

A. Synthesis of Cobalt Oxide nanoparticles

Low temperature solution combustion synthesis [10] was employed to obtain Co_3O_4 nanoparticles and using solution casting polymer nanocomposites of varying concentration of nanoparticles were fabricated [10]

B. Charecterization of the synthesized polymer nanocomposite films

XRD profiles of the polymer nanocomposite films were obtained using Rigaku Miniflex II Diffractometer at 1.542 Å of CuKα radiation with a scanning range of 6^0 to 80^0 by an incremental 0.02^0

III. RESULTS AND DISCUSSION

Figure.1 represents the crystallite shape ellipsoid for pristine polymer and polymer matrix blended with metal oxide nanoparticles. Figure. 2 depict the XRD profiles obtained experimentally and also the profiles which were simulated using whole pattern fitting method. The analysis of the profiles reveals that there is a close match between the XRD profiles with a standard deviation close to 5%. The resulting microcrystalline parameters computed through exponential column length distribution are notified in Table 1 for pristine PVA and metal oxide nanoparticles blended nanocomposites. With the increase in nanoparticle concentration average crystallite area increases which is evident from Table 1.

X-ray diffraction studies were carried out from PEAK – FIT software [10], the line profile analysis were performed deploying Gaussian deconvolution method. The reflection profiles considered for evaluation were subjected to instrumental broadening correction [10].
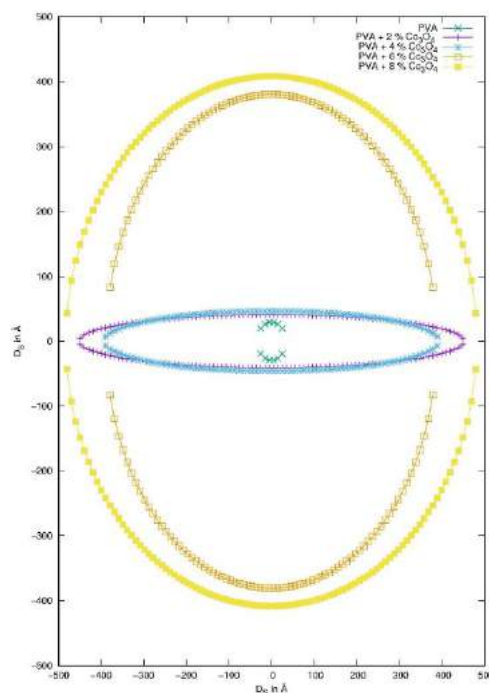
Fig 1. Crystallite shape ellipsoid for pristine polymer and polymer nanocomposites
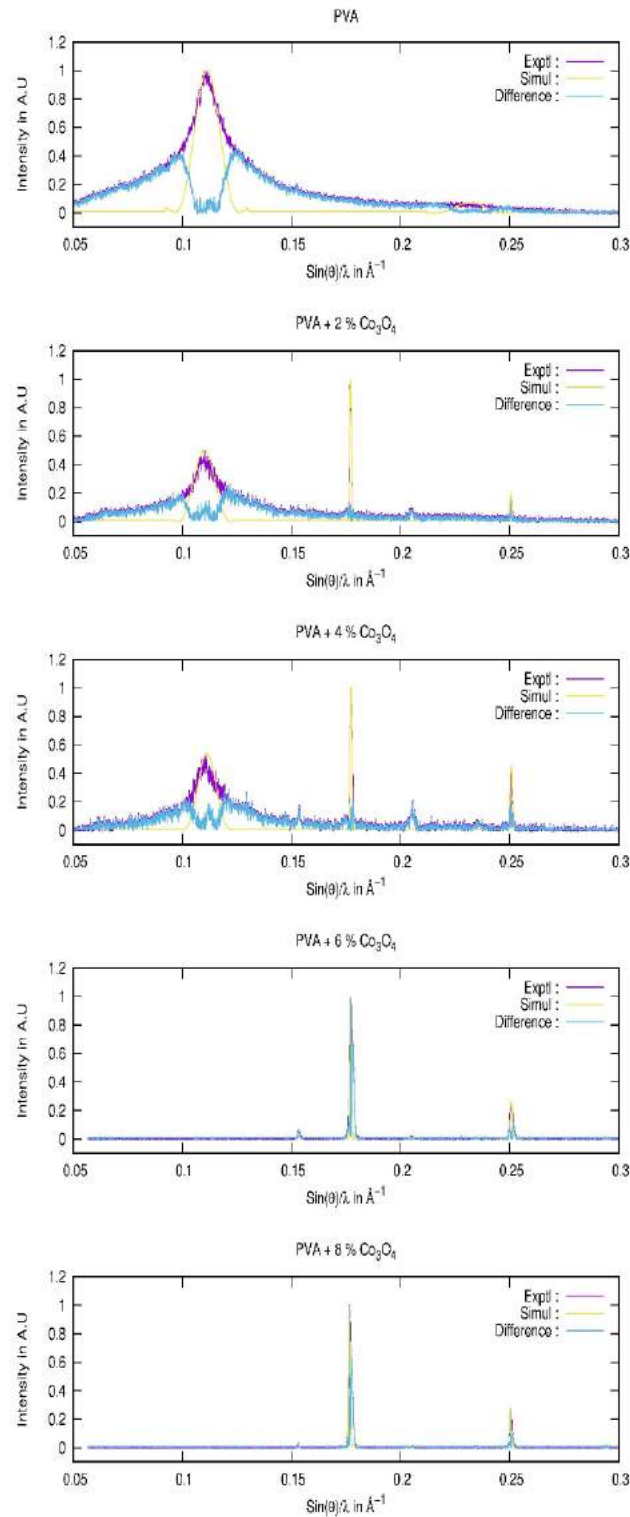
Fig.2. XRD profiles of PVA and PVA/NaCl/ Co_3O_4 nanocomposites

TABLE 1. Computed MICRO crystalline parameters

Samples	Peaks	2θ (deg)	α	g (%) Lattice strain	d_{hkl} (Å)	<N> Crystallite size	D_s (Å)	$α^d$ Stacking faults	β twin faults	delta (E-03)	Crystallite area (Å²)
PVA	1 2	19.70 41.91	2.30 3.41	0.5 0.5	4.50 2.15	7.50 13.8	33.7 29.7	0.33E-6 3.10E-5	7.21E-5 8.54E-5	3.00	1000
PVA + 2 % Co_3O_4	1 2 3	19.53 31.67 45.42	4.89 0.42 0.03	0.5 0 0.5	4.54 2.82 1.99	9.03 160.5 210.0	40.99 452.6 417.9	1.55E-5 2.60E-6 4.57E-9	2.31E-5 2.35E-6 9.38E-9	0.88	18552
PVA + 4 % Co_3O_4	1 2 3	19.57 31.71 45.45	0.78 1.65 0.17	0 0 0	4.49 2.81 1.99	10.26 140.0 175.3	46.06 393.4 348.8	1.94E-5 5.71E-6 1.75E-6	3.79E-5 9.06E-6 3.53E-6	0.89	18120
PVA + 6 % Co_3O_4	1 2	31.66 45.42	1.55 1.04	0 0	2.82 1.99	135.0 195.1	380.7 388.2	6.49E-6 1.63E-6	5.04E-6 1.36E-6	0.87	147787
PVA + 8 % Co_3O_4	1 2	31.58 45.38	0.41 0.61	0 0	2.83 1.99	170.5 205.3	482.5 408.5	1.71E-6 5.62E-9	1.79E-6 2.63E-9	0.57	197101

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Ultrasonic Study of Binary Mixtures of Diethyl Amine with Butyl Acetate and Ethyl Acetate

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ABSTRACT

The studies of ultrasonic velocities, refractive indices are being increasingly used as tools for investigation of the pure components and the nature of inter molecular attraction between the liquid mixture constituents. The refractive indices, densities and ultrasonic velocities of binary mixtures of Butyl acetate and Ethyl Acetate with Diethyl amine have been measured at 302K. From the experimental data the various acoustical parameters such as compressibility (β), Inter molecular free length (Lf), Wada's constant(W), Molar sound fraction(R) and acoustic impedance (Z) have been measured. The molecular interaction existing between the components are also discussed.

Keywords: Ultrasonic velocity, refractive index, binary mixture, molecular interaction, acoustical parameters.

I. INTRODUCTION

Ultrasonic velocities, densities and derived acoustical parameters are of considerable interest in understanding the intermolecular interaction in binary (1-2) mixtures or liquid3, liquid mixtures. The molecular interactions studies can be carried out through non spectroscopic techniques such as dielectric4 magnetic5 ultrasonic velocity measurements have been widely used in the field of interactions and structural aspect evaluations studies. Experimental measurement of ultrasonic velocity and density are used to calculate various acoustical parameters viz. compressibility, Inter molecular free length, Wada's constant, Molar sound fraction or Rao's constant and acoustic impedance at room temperature. Diethyl amine is a protic solvent in nature its shows the various molecular interaction. In the present work an attempt has been made to investigate the behavior of binary solutions of Diethyl amine in butyl acetate and Ethyl acetate with regard to adiabatic compressibility, inter molecular free length and acoustic impedance from ultrasonic measurements at 302K.

II. THEORY AND CALCULATIONS

Ultrasonic velocity is calculated using the formula in which the frequency was 2MHz.

$$V = f \ldots\ldots\ldots\ldots(1)$$

Compressibility of a liquid is one of the physical quantities in fluid mechanics. Knowing the ultrasonic velocity (v) and density (ρ) of the liquid or liquid mixture, the adiabatic compressibility is computed6 using the formula

$$(\beta) = 1/\rho v2 \ldots\ldots\ldots\ldots(2)$$

Intermolecular free length is also calculated using adiabatic compressibility by Jacobson's empirical relation7

$$(Lf) = KJ \beta 1/2 \ldots\ldots\ldots\ldots(3)$$

Where KJ is the Jacobson's constant which is temperature dependent and is obtained from the literature.

The ratio of temperature coefficient of sound velocity to the expansion coefficient is virtually same for all unassociated organic liquids.

$$(R)= (m/\rho)\, v^{1/3} \dots\dots..(4)$$

R is the independent of temperature and called Rao's constant[8, 9, 10].

In the study of sound velocity in liquids another constant has been suggested by wada[11].

$$(W) = (m/\rho)\, \beta^{-1/7} \dots\dots(5)$$

"W' is the Wada's constant or molecular compressibility which is independent of temperature and pressure.

Acoustic impedance is defined by Ohm's analogue[12].

$$Z = \rho V \dots\dots.(6).$$

III. EXPERIMENTAL DETAILS

Solutions of different molecular fraction from 0.01 M to 0.06 M were prepared for each system. Solute (Diethyl amine) and solvents (Butyl acetate and Ethyl acetate) were mixed in the required proportions by mass of the solute and volume of the solvents. All the mass of the solute for different concentrations were done by using electronic balance Shimadzu cooperation, Japan type BL2205 accurate 0.01g. The possible uncertainty in the mole fraction was estimated to be less than 0.01g[13]. The experiment was done at room temperature. Refractive indices were measured using thermostatically controlled Abbes' refractometer with accuracy less 0.0001units. The refractive indexes for six different molar concentrations of liquid systems were measured and are tabulated in tables 1 & 2. The ultrasonic waves in the liquid mixture have been measured using ultrasonic Interferometer (Mittal Enterprises, NewDelhi) working at a fixed frequency of 2MHz. The density was measured as a function of composition of the mixture Diethyl amine with butyl acetate and Ethyl

acetate at 302 K. The density was determined by using a 5 ml specific gravity bottle by relative measurement method with an accuracy of 0.01 kgm-3.
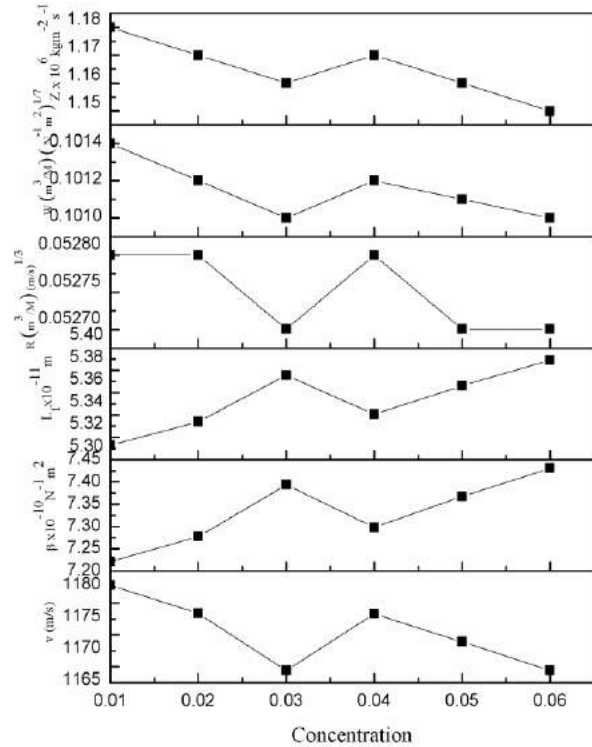
Fig. 1. Concentration vs Ultrasonic Velocity (v), Compressibility (β), Intermolecular free length (Lf), Molar sound fraction (R), Wada's constant (W) and Acoustic Impedance (Z) for the system Diethylamine+Butyl acetate.
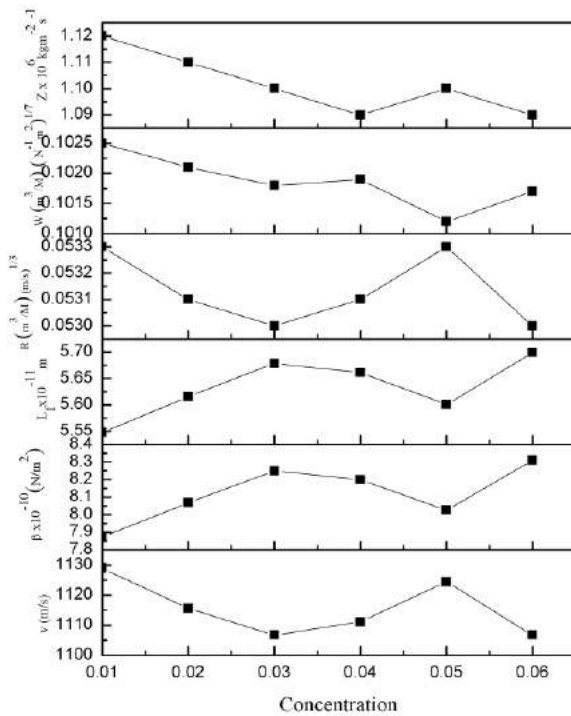
Fig.2. Concentration vs Ultrasonic Velocity (v), Compressibility (β), Intermolecular free length (Lf), Molar sound fraction (R), Wada's constant (W) and Acoustic Impedance (Z) for the system Diethylamine+Ethyll acetate.

IV. RESULT AND DISCUSSIONS

Various acoustical parameters compressibility (β), Inter molecular free length (Lf), Wada's constant (W), Molar sound fraction(R) and acoustic impedance (Z) were calculated using a experimental data of ultrasonic velocity and density by the equations (1-6) (14-18) discussed earlier.

In graph 1 & 2 As molar concentration increases ultrasonic velocity decreases nonlinearly its shows that inter molecular attraction takes place between the components of the mixture and the compressibility, inter molecular free length exhibits opposite trends to that velocity it is well seen in the graph plotted for concentration and various acoustical parameters in graph.1&2 for butyl acetate

and ethyl acetate. Non linear decrease of R, W & Z with the increase of mole fraction indicates the solute-solvent interaction between the liquid mixtures of both systems.

V. CONCLUSION

Ultrasonic velocity investigation in Diethyl amine with Butyl acetate and Ethyl acetate shows the strong molecular interactions. The strength of the solute-solvent interaction depends on concentration, density, inter molecular free length, compressibility.

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Group Discussion : A Cognitive Tool for Life Skills Evaluation

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ABSTRACT

Group Discussion is widely used by leading corporate houses as one of the main rounds of the recruitment process. At New Horizon College of Engineering, Bengaluru, the Centre for Life Skills and Lifelong Learning implemented this method as a tool for assessing industry-readiness. This research paper aims at studying the establishment of the process, the customization and streamlining over a period of 4 batches and offers a view of the degree of success it has achieved, v is-a-vis the initial expectations. It explores salient findings from the process involved: how Group Discussion can be used as a 360 degree tool for evaluating life skills as a whole.

Keywords : Group Discussion, recruitment process, industry-readiness, life skills, 360 degree evaluation tool

I. INTRODUCTION

The authors have been principal contributors in setting up of Group Discussion as an examination and evaluation process at New Horizon College of Engineering, Bengaluru. One of their earlier tasks was setting up the Centre for Life Skills and Lifelong Learning at the college. The thought process was that this was the way forward to differentiate between placements and quality placements. The college was one of the earliest in the city to recognize the need for a dedicated Life Skills department, and establish the same in the world of immense competition for Engineering Graduate placements. It was decided that the students would be introduced to Life Skills at the 2nd year level of their 4-year course. The idea was to bring in the idea of "the best version of oneself" at the basic learning stage.

Deliberations and discussions led to the team members settling upon Group Discussion as the evaluation method for the Life Skills learning. Communication skills was to be the prime focus factor in this process. Other observation factors would be general awareness and basic behavioral etiquettes. The students were asked to turn up in formal wear, grooming principles having been covered in the Semester module.

In December 2017, the first attempt at putting the above idea in place was carried out by the 5-member Life Skills Team. Officials from the Training and Placement Department were invited as External Examiners. The process was executed well, with appropriate prior-planning. More than 850 students appeared for the process which was spaced over a period of three days.

The students had made an attempt to dress up in basic formals: neatly ironed collared full sleeved shirts, formal trousers, formal leather shoes with socks. Formal wear not being part of the daily

campus etiquette guidelines at New Horizon College of Engineering, this was considered to be a notable achievement.

As part of the process, the team members shared their observations over the semesters about how students were being able to use the Group Discussion platform to showcase their abilities with respect to not just the familiar parameters of communication skills, general awareness basic behavioral etiquettes and formal grooming, but also various other life skills. These included critical and creative thinking, stress management, negotiation, group decision making, empathy, emotional intelligence, peer-level micro-mentoring, body language, team work, leadership, ownership, time management, besides a number of non-verbal skills like body language, eye contact, posture, gestures and voice modulation.

The Board of Studies at New Horizon College of Engineering has Alumni members and industry experts as part of its list of affiliates. Their regular recommendations ensure that the syllabus contents at the college are always updated as appropriate.

In late 2018, the module guide was modified to incorporate the findings. They were also brought into practice for the Pre-Placement training process for both Engineering as well as MBA students. It later met reasonable success in a Train-the-trainer program used for New Horizon Faculty Members.

II. RESEARCH

A. Objective-

To establish that Group Discussion is a 360 degree evaluation tool for Life Skills as a whole, encompassing all Life Skills learning.

B. Research Questions-

· How is Group Discussion used for assessing all Life Skills, as per the module under use?

· How can the recommendations benefit the rest of the world?

· How did the Centre for Life Skills and Lifelong Learning at New Horizon College of Engineering streamline the process based on the findings?

C. Literature Review

It has been observed that not much accessible research work exists in the published form, which directly connects Group Discussion to a larger life skills learning platform. A large number of research work exists on using Group Discussion as an evaluation tool for Communication Skills. "Focus Group" is a term used widely to research about group behavior patterns in group decision making.

A good amount of research work exists on "Group Discussion Tips". The primary focuses are the verbal and the non-verbal aspects. Knowledge depth, persuasion skills, analytical skills, personality and leadership have been touched upon as evaluation points for Group Discussion by some articles, not much in-depth analysis has been done.

There exist articles on how Group Discussion has been used to tackle issues ranging from abusive husbands, parental education, psychological debriefings and improving manuscript evaluation procedures. A research by CS Canada (Li Juan, 2014) [1] maps Group Discussion against the parameters of co-operative learning and proximal development. Niti Aayog Literature [2] and NASCOM statistics [3] also carry references to Group Discussion as process to evaluate communication and analytical skills.

Observations from running four batches of 2nd Year Life Skills classes, each having a strength of 800+ students on an average form the primary resource of this research.

On a random basis, templates published by three top sources (YUVA, infoway24.com and researchgate.net) are shown in figures (1), (2) and (3) below:

Fig. 1 [4]

Fig. 2 [5]

Fig. 3 [6]

The above represent a cross-section of the existing research on the subject.

III. METHODOLOGY AND FINDINGS

A. Kolb's Learning Cycle-
- Abstract Conceptualization
- Active Experimentation
- Concrete Experience
- Reflective Observation

As represented in Figure (4)
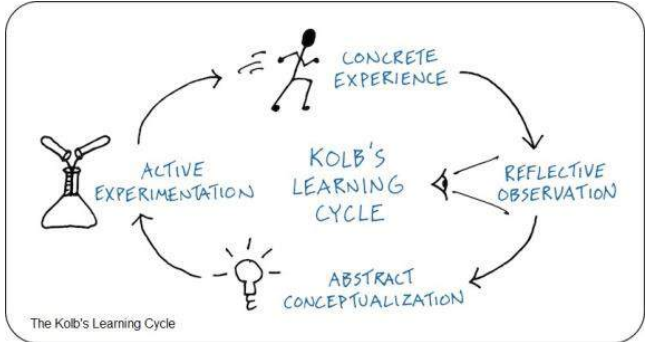
Fig. 4 [7]

As part of the regular curriculum for 2nd year students, Group Discussion was designed as the culmination of the semester. The same process was also followed for the pre-placement training for final year students. It has been observed that to excel in Group Discussion, students had developed the newspaper-reading habit, had begun to exercise negotiation skills (as opposed to settling disputes through arguments) and started to dress better. Notable efforts were observed in the following:

- Empathy: The understanding of the difference between sympathy and empathy was put into use.
- Time Management: Learning to use the allotted time to not only display their communication and thinking skills, but going on to use the available time to display all the other Life Skills learning from the semester.
- Leadership: Group Discussion is an able platform to display leadership skills, especially when the discussion goes off-topic
- Teamwork: Group behaviors and using non-verbal gestures to help non-starters to gain courage to join in.

- Stress Management: Group Discussion can be stressful if the topic is alien to a participant, or in the case of too many people opposing one participant, or not being able to have performed to one's ability in first attempt (s), etc.

- Etiquette: Students started to display improved etiquettes with respect to campus, social and conversational etiquettes. Interrupting other speakers at the right moments during the Group Discussion proved to be a good practice opportunity.

- Critical and lateral thinking: To get the basics right, the critical thinking is crucial. Lateral thinking gains importance to get the extra brownie points, bonus marks, and assumes utmost importance in the case of it being an elimination process.

- Emotional Intelligence: Leadership skills, Empathy, Inter-personal skills, motivation, self-regulation all form part of a rounded delivery in a Group Discussion.

- Ownership: As is taught in the Life Skills module, ownership is equivalent to leadership. Group Discussion sessions throw up opportunities to take up ownership of the thought flow.

- Group Decision Making: Depending on the topic in focus, ample opportunities to explore group decision making options are exercised.

- Negotiation Management: Debate, logic with negotiation skills of being able to consider all perspectives.

- SWOT: Thorough self awareness of one's strengths, weaknesses, opportunities and threats helps one strategize one's preparation for the evaluation process.

- Peer-level Micro-mentoring: The process followed ensures that students learn while observing other participants, giving them feedback about their performance. This also shows a way in which students can practice Group Discussion even in the absence of a trainer.

- Non-verbal skills: Body language, eye contact, posture, gestures and the value of pauses have been focused on.

- Listening Skills: Active and effective listening has proved to be one of the most important skills to be successful in Group Discussion.

B. Survey of placement records-

The 1st batch to undergo the Life Skills module in 2017 came up for Pre-Placement training in mid-2019. By this time, the implementations had been put into effect. A refresher course for the Group Discussion was done for the group. Having gone through the module earlier in end-2017, the batch was better equipped to receive the training. The results showed in the placement record of the on-going placement batch. While the exact figures of an on-going placement batch cannot be made public yet, it definitely showed a cumulative qualitative and quantitative improvement of more than 20% over the previous year. While not all companies used Group Discussion as a step for their recruitment process, a significant number did. Moreover, the learning from the process had contributed to a well-rounded preparation.

C. Industry feedback-

The authors had, in their own capacities, been in positions to interact with members of the industry about recruitment-process candidate-feedback. The discussed points were implemented into the module process as and when appropriate. Two examples:

Mu-Sigma is an IT company in Bangalore. They offer a rather attractive pay package, and hence are a much sought-after employer. They have a Group Discussion as their main round. Their topics are often based on marketing of IT products within select geographical zones. This has often tended to confuse Engineering candidates, who find it a challenge to learn about marketing strategies overnight. The short-listed students were taken through a crash course, wherein they were just reminded of the Group Discussion basics, besides the importance of doing their appropriate homework for every selection process: in this case, a quick Google

search of marketing strategies. They had to be reminded that they would not be evaluated for choice of strategy. The effort yielded a good success rate.

Accor Hotels is a hotel company, with its head quarters in France. They often give topics based on gender sensitivity as part of their recruitment process for Management Trainees. Long before the LGBT law (Section 377) was passed in India, they gave topics related to entertaining of homo-sexual guests in their hotels. They expected candidates to deal with the given situation normally, without any visual discomfort, as theirs is a French company, and homosexuality has been legal in France for long. While this is an example from a non-engineering industry, their case study is done to illustrate the importance of doing one's homework about the company being interviewed for.

IV. ANALYSIS

The findings of the research indicate a definite connection between Group Discussion and all the Life Skills learning of the 2nd Year module imparted at New Horizon College of Engineering. The module includes the following topics:

- Self Awareness – includes core self evaluation, emotional intelligence, SWOT
- Critical and Lateral thinking
- Stress, Time and Negotiation Management
- Leadership, ownership and teamwork
- Grooming and Etiquettes
- Individual and Group decision making

It also includes a thorough evaluation of the following 1st year modules:

- English Communication
- Non –verbal communication: includes confidence, body language, posture, gestures, eye-contact, voice modulation and the value of pauses

As may be equated, a 360 degree life skills evaluation tool essentially marks a candidate's industry-readiness overall.

Group Discussion has also proved to be a good starting platform for those fighting to overcome the fear of public speaking. Group Discussion provide for a comparative comfort zone of a smaller peer group, as opposed to a larger audience to begin with.

The peer-level micro-mentoring process makes it easier to mend salient bad habits. It also helps to identify the idiosyncrasies, which may otherwise remain unobserved. An instructor pointing out mistakes, as opposed to a peer doing the same often has different outcomes.

The increased number of students taking up the newspaper reading habit is a direct success of the process. The present generation is often found more adept at following the news through mobile phone apps. That need not be discouraged, though. The bottom-line is: keeping abreast of what is happening in one's world should not be akin to an assigned task.

Attitude cannot be taught, yet is a major parameter of evaluation in the recruitment process. The self-preparation involved in getting ready for Group Discussion is a sound tool as an attitude fine-tuner.

The Centre for Life Skills and Lifelong Learning at New Horizon College of Engineering has incorporated some of the above observations as part of its semester module to impart upgraded learning to the students.

V. CONCLUSION

The observations made by the Centre for Life Skills and Lifelong Learning with relation to Group Discussion being a 360 degree evaluation have been incorporated in its updated curriculum. These have emanated from repeatedly running the program for batches of students.

The measurement of outcome is not a uniform system which has been adopted and followed universally.

This research work highlights some gaps as identified in the process. The purpose of the research is to find solutions to those gaps. Making the learning process more rounded is a constant endeavor.

It is recommended that the findings be universally adopted, by educators as well as industry experts.

It leaves scope for further research on the subject. The importance of Emotional Intelligence in Group Discussion, how an effective SWOT analysis may impact performance in Group Discussion, the importance of timing and humour are some of the areas which, one feels, may be looked deeper into.

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Engineers: Ensuring Excellence In and Beyond the Campus

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ABSTRACT

Every Engineering College in India invariably has the phrase "ensure academic excellence" in its vision statement. Survey reports in the last 10-15 years by various organisations in India, including NASSCOM, tend to cast a shadow on these claims of engineering colleges being institutions of excellence. These surveys indicate a growing gap between the number of engineering graduates passing out every year from the campus and those entering the corporate world. This paper looks at the reasons for the decline in academically qualified engineering graduates not being considered "qualified" for entry into the corporate world. It further explores the role of the stake holders and the means to mould raw students into qualitative engineers who can excel in their personal and professional fronts.

Keywords : Engineering graduates, Academic excellence, Quality, Employability

I. INTRODUCTION

In the year 2015, The United Nations General Assembly adopted the 2030 agenda for Sustainable Development Goals (SDGs), listing 17 SDGs. SDG 4 talks about Inclusive and Quality Education for all. It underlines the importance of equity and quality attached to education across the globe.

GOAL 4: QUALITY EDUCATION

"Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".[1]

https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-4-quality-education.html

The Vision statement of Carneige Mellon University College of Engineering, ranked at number 4 in "Best Engineering Schools" in the US, reads as follows:

"Our vision is to be a world-class engineering college recognised for excellence, innovation and the societal relevance and impact of its pursuits". [2]

https://engineering.cmu.edu/about-us/leadership/vision-mission.html

What does excellence in engineering signify?

Education is what remains after one has forgotten everything one learned at the school".

Albert Einstein

Quality education is not just delivering the contents of the syllabus. Excellence in engineering education should be able to mould and deliver students who are productive, capable of

understanding problems and provide solutions to challenging Domestic and global societal requirements, current and future.

Engineering colleges in India also have their Vision and Mission statements which echo similar idealistic objectives. Almost all of them use phrases like "Excellence in technical education" "Innovative Research programmes" , "Skilled and trained Engineers of highest quality" , "Core human values" as an integral part of their vision statements. While they may match the Vision and Mission statement of Carnegie Mellon University Engineering College in terms of phrases used, none of them seem to have produced tangible results to evidence the claim envisioned in their Vision and Mission statements. In fact, only three Indian institutes -- IIT-Bombay, IIT-Delhi and IISc-Bangalore -- have found place among the top 200 in the prestigious Quacquarelli Symonds (QS) World University Rankings [3]

II. OBJECTIVE

· Identify the major factors for academically qualified engineering graduates not getting industry acceptance in recruitment.

· Evaluate the current role and behaviour of the stakeholders, viz. AICTE/Universities / Colleges, Teachers and Students.

· Identify the limitations faced by the stakeholders

· Suggest proactive steps by the stake holders to bridge the structural gaps and build competencies

III. METHODOLOGY

· Combination of quantitative and qualitative research,

· Observations and assumptions during the periodical interaction with the faculty and students of engineering colleges during training sessions

The paper proposes to identify the underlying issues and explore the policy and behavioural contribution of each stakeholder and its impact on the declining quality of engineering graduates in pursuit of their career.

IV. FINDINGS

· According to the NASSCOM-McKinsey report "Perspective 2020: Transform Business, Transform India" (2009), only 26% of India's Engineering graduates are employable as they lack employability skills, despite technical knowledge in traditional engineering. [4]

·
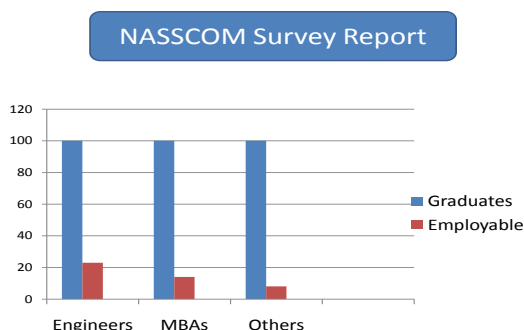
As per National Employability Report Engineers Annual Report 2019, by Aspiring Minds, 80% of Engineers are not deemed fit to be employed due to their skill gap vis a vis industry expectations.

· 97% of engineers cannot speak English fluently. 67% of engineers cannot perform any language skill like listening, reading, writing and speaking.

· Only 2.5% of engineers are good at next generation technological skills like Artificial Intelligence, Data Science, Machine Learning etc., [5]
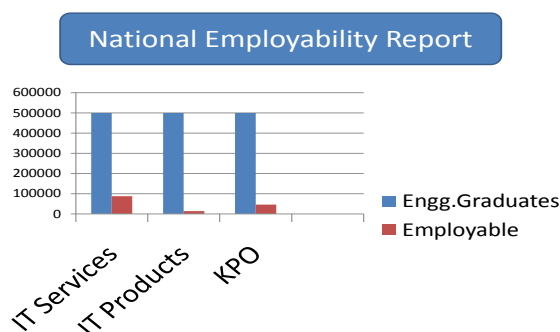
• A recent statement by the CEO of Tech Mahindra also echoes a much grave sentiment, where he affirms that 94% of IT graduates are not employable.

V. ANALYSIS OF STAKEHOLDERS' ROLE

A. Government Policies/ AICTE:

The policies adopted by various state governments over the years in sanctioning new engineering colleges can be cited as a major reason for the decline in employability percentage of engineers. At the time of Independence in 1947, India had a sanctioned intake of 2500 engineering students. [6]
.
With the global demand for engineers, state governments across India indiscriminately sanctioned hundreds of colleges year after year. According to AICET, for the academic year 2018, the student intake capacity was 16,62,470, with the actual enrolment being 8,18,787. Around 42% of them have been placed in various industries, up from 29% during the academic year 2013-14. [7]

From the above, it can observed that, when the sanctioned intake is 4-5 times disproportionate to the industry requirements and the enrolment is more than twice the opportunities, it naturally causes a glut resulting in non-absorption of approximately 60% of the engineering graduates.
So, is over capacity intake a major reason for the high percentage of unemployability among engineers?

On the positive, having recognised the engineering crisis in India, AICTE has recommended not to create new capacities in traditional engineering courses for the next two years.

B. Engineering Colleges / Universities:
Engineering colleges in India can be categorised into:

• Institutes of National Importance (23 IITs, 31 NITs)

• State Government owned Universities and Private Engineering Universities/colleges.

Conferring the status of Institutes of National Importance on IITs and NITs, tells a lot about the high quality of education that these institutes offer. What make IITs and NITs institutions of excellence are the infrastructure, world class labs to experiment and apply the engineering concepts learnt, state of art of machines, introduction of new generation courses, opportunity to explore current trends by attending national and international conferences, industry exposure through internships, libraries to aid research facilities and above all, exposure to lectures by world class professors. One of the major factors for the establishment of the above facilities is government support. While the student intake in IITs and NITs is just 3% of the total number of students enrolling for engineering education, 50% of the government fund towards higher education goes to these Institutes of National Importance. No wonder, the cream of meritorious students vie to get admission into these institutions through the tougher JEE qualifying examination. It is this creamy layer of scholarly students who confer the distinction of IITs and NITs clocking 75%-80% in campus placements with hefty salary packages.

On the other hand, most private engineering colleges lack these facilities which have a bearing on the poor quality of engineering education offered in these colleges. Barring about 100 colleges of longstanding and repute which are managed by academic professionals, the rest are run by wealthy businessmen whose motive is more oriented towards profit than quality education. A newly started engineering college needs to satisfy statutory requirements stipulated by regulatory and assessment bodies. Approval from AICTE to run an engineering college, a high grade of accreditation (A, A+, A++) from National Assessment and Accreditation Council (NAAC) for the institution, periodical accreditations of its programmes by National Board of

Accreditation (NBA), ranking of its standard of education by the National Institute Ranking Framework (NIRF) are some of the major statutory requirements to be fulfilled, before it makes an imprint as an institute of repute. That is when the institution starts attracting meritorious and talented students and faculty. In the build up to attract quality students, it has to first have quality infrastructure which entails huge investment and working capital. This is a major limitation and challenge for newly established colleges.

Despite these limitations, quality conscious institutions are constantly striving to provide better facilities to the students. New initiatives undertaken by some institutions to improve the students' technical skills and employability skills are:

· On the academic front, quality conscious colleges are collaborating with foreign governments and institutions through student exchange programmes and certifications from foreign universities.

· To provide cutting edge technology to students, colleges, in partnership with industries are establishing Centres of Excellence (CoE) for each stream of engineering study

Centre of Excellence bridges the gap between what is taught in engineering colleges and what the industry needs. CoE is a specialised training centre related to various cutting edge technologies. The CoE, apart from imparting engineering knowledge, helps create research environment by providing opportunities to carry out joint research projects by students, faculty and industry. CoE helps the students to guage their interest and mend their mind towards research, a very vital part of Engineering. Through this, students develop the two crucial skills, creative thinking and critical thinking.

· Colleges need to be proactive in bringing about awareness about industry expectations by imparting employability skills and life skills.

On the Employability skills front, it has been observed that many colleges make a half-hearted approach by outsourcing trainers to provide 1-3 weeks' placement training to 7th semester students. Does a pre-recruitment training of a short duration, just a few weeks before the recruitment drive, help students gain employability skills like leadership, teamwork, time management, critical thinking, creative thinking, analytical thinking, problem solving, decision making skills, interpersonal skills, communication skills, professional ethics? Isn't it one of the reasons for students not being industry ready?

It is recommended that colleges do not treat pre-recruitment training as a yearly ritual for final year students, but prepare the students well in advance to be industry ready by understanding industry expectations. The lead taken by New Horizon College of Engineering, Bangalore by establishing a dedicated "Centre for Life Skills and Lifelong Learning" is worth mentioning. The Centre focuses on imparting language and communication skills right from the first semester and follows it with life skills training in the second year of engineering. Students are initiated into goal setting, team work, group discussion, ownership, swot, critical and creative thinking among others. A novel initiative is the Self-study programme, where teams of students branch out to corporate offices and interact with the industry HRs to gain in-person, in-depth idea about what the industry expects from fresh engineering graduates. The experience enables students to understand industry needs and work well in advance on the skills expectations of the industry.

C. Teaching Faculty

Education is not simply a content delivery system; rather, it is a system designed to help all the students reach their full potential and enter society as full and productive citizens.

"The value of a college education is not the learning of many facts, but the training of the mind to think"
- Albert Einstein.

Training engineering minds to excel is the responsibility of the teachers. Engineers need to be innovative and creative, as the nation's economic development depends on the role engineers play in nation building. They need to develop critical thinking process to find solutions to complex problems in the fields of telecommunication, information technology, machine learning, AI and Robotics etc. Hence, it is imperative that teaching should address application of problem based and project based learning of engineering education. The calibre of teachers and their teaching methods are critical to achieve this objective. But very few students develop these skills, which are critical at the workplace.

The application of Bloom's Taxonomy in the teaching field is relevant to develop these skills among students.[10] But, how equipped are teachers to train engineering minds in developing analytical, critical and creative skills? At a recent workshop on Bloom's Taxonomy, the question papers prepared by engineering faculty were analysed. After explaining Blooms levels L1 to L6, the participating faculty were given past question papers prepared by their department colleagues. Then they were asked to match the questions to the Bloom's levels marked against each question. It was very clear from this exercise that the nature of most questions did not match the L3 to L6 levels marked against them, indicating a mismatch between application (L3), analysis (L4) and evaluation levels (L5) indicated. Faculties need to train themselves on how ask questions appropriate to the levels. Hence, training the faculty to frame appropriate questions according to Bloom's level is imperative to train the students to understand the questions, apply concepts, analyse the problem and evaluate the options to solve problems.

· **Proactive curriculum:**

The rapid improvement in technology platforms has led to a huge gap between industry requirements in terms of technical know-how and student learning in the classroom. While the industry engages updated technology, classrooms teach outdated technology. Engineering college faculties play a crucial role in bringing next gen technologies to the classrooms through timely curriculum changes. Worth noting is AICTE's recommendations that emerging technologies like Artificial Intelligence, Internet of things, 3D printing, Block chain etc. should be made part of the curriculum. The same is endorsed by NASSCOM-BCG study and FICCI-NASSCOM-EY study. [7].

It puts the faculty also to be on the front foot in learning these technologies and master the knowledge to train the students in these domains.

· Qualitative Benchmark Assessment System:

"Quality is more than a promise, it is genuine performance".

The quality of an institution is interdependent on standards the institute sets for assessment. It is an assurance that the product certified by the institution is really worth the value printed on the certificate and is a guarantee to the employer as regards the knowledge and performance of the certificate holder. When a graduate from IIT shows his or her marks sheet, employers trust the assessment, as they are aware that IITs use standard testing benchmarks and the academic assessment of the candidate is genuine. But do the score cards of private and autonomous engineering colleges truly reflect the candidate's knowledge, ability and capability? There is lot of resentment among the teaching faculty that quality of assessment is diluted due to pressure from the college managements to show a higher pass percentage. It is imperative that the academic heads of colleges interact with the college management and brainstorm the need to frame a qualitative assessment system that builds employers' trust in the finished products of the institution. Dilution in assessment criteria is a major cause for deterioration

in the quality of engineers, resulting in their non-employment.

D. Students

The role of an engineer is vital to the well-being of the society and the economic development of a nation. Be it the field of manufacturing, transport, construction, aviation, petrochemicals, medical equipments etc., engineers strive to make living better for the people. The present rapidly changing technological era demands that engineering minds keep pace with the rapidly changing needs through innovative and critical approach to emerging problems and provide simple solutions.

Emerging engineers need to address current challenges facing humanity. The environmental crisis, conserving water and energy, food crisis, access to education beyond classrooms, technological advances in healthcare, cyber security, space exploration are some of the great challenges engineers are faced with. [8]

When we talk of quality, it is not just the learning environment, the quality of faculty and the methodology of teaching that matters. What matters most is the learner's passion towards exploring the plethora of opportunities, embrace challenges and visualise immense possibilities to make the world a better place to live.

· Are our current generation of engineering students passionate about taking up these challenges?

Over the years, classroom interaction with the students has thrown some light on the answer to this question. It has been observed that roughly 25% of students are into engineering courses because of parental pressure are not of self volition. Another 40% fancy engineering as a student's social status and put up only 50% effort, thus falling short of industry expectations. The rest nourish the ambition to become engineers right from their school days. Out

of these about 10% -15% are focussed with clarity on their area of specialisation. This possibly reflects on the employability quotient of the graduate engineers.

· Most students do not have career goals.
Majority of the final year students are unclear and confused about their career goals and career growth. This was evidenced during the Resume writing part of the pre-recruitment training. Majority of the students do not have a clear cut career vision, and just do a cut and paste job of career objectives found of career websites.

The silver lining is, at New Horizon College of Engineering, Bangalore, the students are briefed at the beginning of their 3rd semester about resume building rather than resume writing which is normally done in the final year of engineering. It is highly recommended that colleges tune their students on how to build their resume right from the time they step into engineering.

· **Employability Skills.**
Employability skills are "a set of achievements, understandings and personal attributes that make individuals more likely to gain employment and to be successful in their chosen professions".

Over 95% of the students are unaware of the term "employability skills", let alone bother about the importance of developing the skills that are essential workplace skills. Skills can be classified under

· Basic skills
· Critical skills
· Crucial skills

Basic skills: Listening, Speaking, Reading and Writing

Communication skills in English is a basic skill without which, engineers of today, wouldn't fit into the global employment scenario. While requirement of skills that fall under critical skills may vary from

industry to industry and job role to job role, the one skill that is always mentioned in candidate eligibility list communication skill. Workplace communication involves fluency in speaking English, proficiency in writing, along with listening, reading and comprehending abilities.[9]

While all the students, without exception, are aware that one's communication skill is tested at all stages of the interview process in the form of Verbal ability test, Group discussion, Technical and Personal interview, hardly a small percentage of students put in conscious efforts to develop communication skill. According to National Employability Report for Engineers by Aspirin Minds, 97% of Indian engineers cannot speak English and 67% of all engineers do not possess any language skill (reading, writing, listening and speaking). This is a problem inherited by students from their school years. Engineering Universities in India have made only a cosmetic approach to impart communication skills at the graduate level. This is a major factor affecting employability, especially students who have done their early education in tier 2 and tier 3 places. Critical skills: Team spirit, Leadership skills, Time management, Initiative and enterprise, Positive mental attitude, Planning and organizing, Self-motivation, Interpersonal skill.

Students should be incentivized to imbibe some of these skills. It is recommended that a part of the internal assessment marks could be ear marked for exhibiting some of these skills during the course. For example, students are given individual assignments in each subject of the semester. While 75% of the internal marks can be set aside for the quality of the assignment, the remaining 25% can be awarded for timely submission (time management). Student participation in club activities, organizing events, new initiatives that display team spirit, leadership, initiative, planning and organizing could be other means to make the students develop skills for personal and professional growth.

Students should be made aware of the importance of these critical skills in the workplace. While life skills classes, through individual and group activities foster some of these skills, students should be self-motivated to inculcate these skills as part of their personal traits and outlook.

Crucial skills: Analytical thinking, Critical thinking, Creative thinking, Decision making, and Problem solving.

These skills are also known as managerial skills, which are required for career growth to the managerial level. Once a student imbibes these skills mentioned under critical skills, these crucial skills will also develop naturally over a period of time, as one gains more of professional experience.

VI. CONCLUSION

Survey of engineering students in India indicate that majority of them are unlikely to be employed by major corporate. The reason cited is that, technically they lag behind in keeping update with emerging next gen technologies. They are also woefully inadequate at personal and workplace skills that complement fresher-industry requirements and expectations .It is the responsibility of the stakeholders to bridge the structural gap. AICTE has recommended curriculum updation to keep pace with rapid technology changes. Though the college managements have acknowledged the skill gap in their students, they are yet to swiftly respond and create the industry ready atmosphere on their campus. The faculty in engineering colleges have a greater role to play in moulding the students into productive engineers. They should devise benchmark assessments to encourage students to work on the skills fundamental to career and personality growth. The quality of students is a cause for worry as many of them lack the passion and academic urge to upskill themselves. It is highly recommended that colleges should work closely with industries to engage industry -student interaction through Centre of

Excellence, internships and expert talks. Students, on their part need to motivate themselves to improve their skills, especially communication skills, critical and creative thinking skills. We are in the middle of an engineering crisis. To ensure that India prospers through qualified engineers, all the stakeholders should work towards improving the quality of education imparted and make their campus a centre of excellence.

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Do Trainers want to Design Learner-centric Course/ Moocs? A Survey of a Focus Group of Life Skills Trainers

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ABSTRACT

Design thinking is a buzz word in the marketplace. As a trainer and undergrad educator in life skills domain, I have never thought deeply about pedagogical aspects. This research paper tries to delve into the educators' perspective of designing a life skills course keeping the student/learners in center stage. Here I have tried to understand how a focus group of life skills educators think about the need of such an exercise to become subject matter experts in life skills course design.

I was also keen to introspect on their views of getting into course design aspects from the standpoint of professionals who deliver the course. In other words, do the faculty members want to know or want to be aware of student/learner-centric life skills course design. Subsequently, I have extrapolated the same data from the survey to the MOOCs (Massive open online courses) life skills course design.

The seamless integration of design and delivery and a full learning cycle from designing a course, delivering and assessment of both the course and methods of assessing the learning effectiveness would be worth another effort to investigate the mindsets of a particular focus group of educators.

The brief study shows how the group of educators have a mixed response but do have a general idea and intention to make the course more learner-centric especially if it is online MOOCs (Massive open online courses)

Keywords : Life skills MOOCs, Soft skills MOOCs, Educator viewpoint, learner-centric approach, course design, online courses, Life skills trainer views, Soft skills trainer standpoint, trainers' approach, student-centric courses.

I. INTRODUCTION

Designing a course in Life skills/soft skills is a challenge for trainers or educators because it needs a detailed planning and course design skills. Most educators stick to the course materials provided to them and try to plan within it to deliver the course. However a step backward to engineer the course

design and suit specific student/learner audiences would do a great deal of good for them as it would be 'right from their hearts'. In this brief paper, I have tried to understand why designing a course is a challenge and what does the focus group that I interacted with tell us about the mindsets towards designing the course on a learner-centric mode which they would love to deliver with care and interest to their worthy audiences.

II.   OBJECTIVE

To understand whether life skills/soft skills trainers are aware and interested in designing a learner-centric course and if the same can be extrapolated to life skills MOOCs.

III.   RESEARCH QUESTION

Is the focus group of life skills trainers aware of learner-centric course design?

Do they want and intend to design a course and deliver the same?

IV.   METHODOLOGY

Survey questionnaire was given to the focus group and a select number of trainers were interviewed in depth to understand the standpoint and iterations in their process of delivering programs in life skills.

A review of research on course design, learner-centric approach and MOOC course principles was done based on the available body of knowledge on the World Wide Web.

V. LITERATURE REVIEW

The success of a course commences before the first day of a training session. Excellent planning during the steps of a course design not only makes content delivery easier and more enjoyable, but also facilitates student learning. Once a course is planned, teaching involves implementing the course design on a day-to-day level. This two prong approach for trainers is recommended to take their professional

excellence to the next level. It is better to design the course and deliver it to make learners benefit to the maximum.

1) Course Design basics:
For an effective course design, we need to:

 Think of timing and logistics (Schedules, classrooms other administrative requisites)

 Talk to students to understand their needs(Audience analysis)

 Tailor learning objectives (Learning outcomes)

 Think of assessments methods – (assignments/quizzes/project/tests and frequency)

 Tailor appropriate course delivery strategies (Approach – present, practice,produce or Engage, Stimulate and Activate models , Activities, Case studies ,videos, games etc.) [1]

2) Considering Learner-centric model :
Once we decide to design a course and be ready with the steps, we need to ponder on the approach to be adapted.

Do we want a content-centric/teacher-centric approach or the latest successful learner-centric approach?

The modern learning thought is understandably switching over to learner-centered approach. [2] This approach has to be embraced when designing a course in life skills or soft skills.

3) Can Trainers/Course facilitators take up the challenge ?
As we have understood the steps to course design and the approach we would follow, we need to consider if the trainers/teachers are motivated to create a course based on the learner-centric approach. As per the proponents and experts in education, it is better that the teachers get involved more into the course design part. Upgrading to skills required for a course design and keeping to the boundaries laid by

their parent institution would be a win-win situation for all stakeholders in the higher education lifecycle.

Teachers or trainers need to take new roles in developing

Curriculum or a course but the design aspect of courses could conflict with traditional expectations. Designing a curriculum involves teachers'/trainers' flexibility and uniformity based on the norms of an institution, state or country's education policies when it comes to assessment. [3]

It is but natural to hear trainers complaining about the content of the syllabus given to them to deliver the course. To plug this gap and confusion, trainers must plan, prepare or up skill to become course designers. [4]

It is in the best interest that trainers require to learn instructional design skills and students learning styles. It is in their own interest to upscale to creating a course design for professional excellence and to foster the future citizen minds.

Trainers generally find it hard to adjust their styles to packaged courses and this leads to a course delivery that is rigid, and hardly cater to the needs of their learners. [5]

4) Curious case of Moocs and online courses:

The traditional face to face physical class rooms are going to be out of fashion in times to come. Educators need to be with the times to catch up with technology and screen presence, the bedfellows of millennial learners. So, to create an online course all one needs is precious time, mindset and motivation, and immense imagination.

Soft skills/Life skills trainers need to be experts in their field and this requires passion and commitment. Again as in traditional course delivery, it is worth it to be passionate, to give time to design a learner-centric course in online courses too. If we think about teachers in our lives, we vividly remember the

ones who were passionate about sharing their knowledge and expertise by centering on our needs. Such sessions were and will be memorable and uplifting. [6]

5) Carrying the content to the console :

If content PDFs and videos are ready, one needs to prepare quizzes, create a course certificate, and a landing page. This hardly takes a week to create an online course if you spare two hours a day.

A MOOC is designed for easily repeatable courses; offer pre-recorded, and fixed courses and add quizzes and exams, that could have optional instructor support to help in case of clarifications required by learners. MOOCs come with many benefits for students: Improved access to higher education and flexibility in terms of time and location. It is classrooms coming to your homes like entertainment came to your doorsteps in the form of TVs.

MOOCs generally offer learner to learner interactions and quicker feedback on assessments. This is in addition to traditional course materials. As of June 2012, Wikipedia puts MOOCs registrations at more than 1.5 million learners.

The graphs below taken from the MOOCs platform, Class Central shows the growth of Mooc and the subject-wise distribution of courses:

By the Numbers: MOOCs in 2018

CLASS CENTRAL
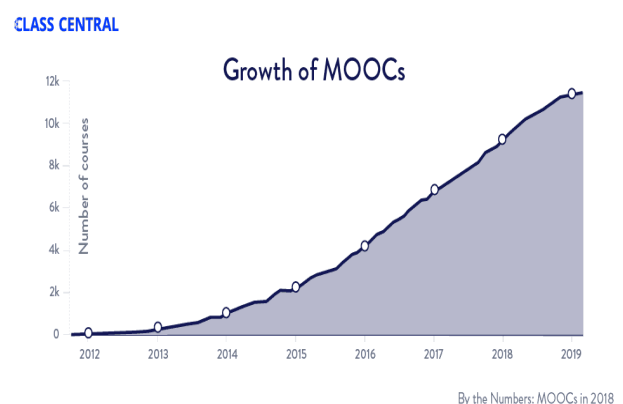
Course Distribution
by Subject

By the Numbers: MOOCs in 2018
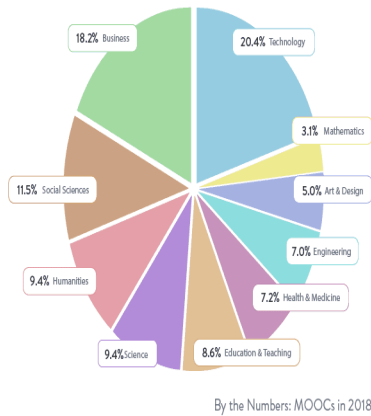
[7]

6) Cutting down on time ? Try mini online course design:

For very busy trainers and teachers a mini-course is recommended. It is a short online course that takes 2 hours or less to work on. The offline content you have at hand can be slightly modified (to suit to the new audience).This is the best if we have never created an online course before. We are on an experimental mode using authoring tools, new social media platforms.

A mini-course can also be used to test the audience and can be like a movie teaser.Mini courses require less resources and can be 0.5 – 2 hours long. If your audience shows interest in your mini-course, that means that you have proof that a detailed course would be a worthwhile effort. And you will gain some experience in designing an online course.

Growing institutions can ensure faculty up gradation by conducting workshops and learning by doing sessions for mini course design. This would really enhance learner-trainer experience.

In the above paragraphs, we have noted the need for trainers to step back to become course creators.

7) Caring for learners – learner-centric approach :

Now, let's sift and understand what learner-centric or student-centric in course design means. If a course is designed in a learner-centric method, it means tremendous thought has been given to the requirements, interest and skills sets of students/learners. As opposed to content-centric / teacher-centric design, where teacher lists out topics and plans the time to deliver each one. The difference in a learner-centric method is to think first what learners can learn in relation to a particular course and then work on how to assess students' performance and arrive at delivery or facilitation techniques.

Students / Learners are at the center of the learning cycle. [8]
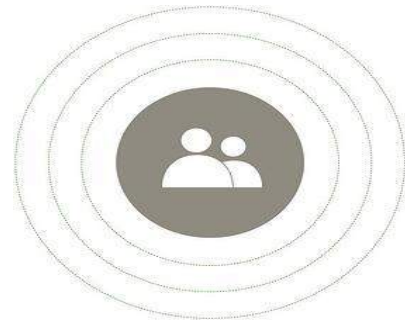
Various research projects have led to the conclusion that a learner-centric approach is the best so far. The learner would have iterated varied situations, behavioral development or had had unique experiences. These factors affect learners while acquiring knowledge and its application. Applying a teacher-centered or content-centered approach vis-à-vis learner-centered one is a path to course failure.

Keeping Learner at the center of course design:
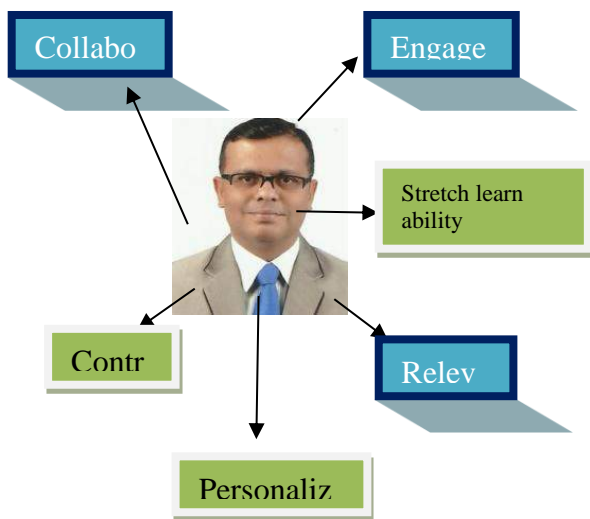
a) Stretching learnability

Learners who confront relevant challenges while learning are required to apply knowledge, not just remember it. As course designers our main aim should be to engage learners and challenge their understanding at critical junctures. We need to include challenging tasks that enable them to apply known and learnt knowledge.

b) Engagement

Engagement of learners should go beyond clicking an icon on the screen or acknowledging the lecture in a classroom. The connect should happen at a cognitive level. Learners should be encouraged to process moments of thoughtful reflection during the course. The content has to connect their intellect and emotions as well. Only this kind of deep and meaningful engagement leads to a lasting change.

We should introduce real or imaginary situations where they have to arrive at solutions using the content. Do use case-studies and scenarios that get the learner to analyze information and apply to the particular situation.

c) Personalization

Some prefer reading to listening or the majority of learners may expect on-time feedback through mails/chat windows in a MOOC or an in-class oral feedback in offline programs. Learning styles are always different and the multiple intelligence theory proves this. Moreover diverse backgrounds of learners need to be taken into account.

We should remember to include multiple formats in the content – audio-videos, visual graphs, charts, quizzes, activities etc. Determining educational background, interest and goals of learner audience would help the process of personalization.

d) Control

Allowing students a sense of control and responsibility would make all the above aspects come together for a successful course design. Learners with control over the elements of the content would want to learn with better motivation and application and become active learners.

e) Collaboration

Effective real life learning is collaborative, a group/pair task-oriented one. Learners must be encouraged to collaborate with peers to actively ask and provide information and derive cognitive insights. These result in a heterogeneous set of notions and students can soak into a rainbow of standpoints to make a colorful mix of an ideal and progressive society.

The content must empower learners to talk to each other in a classroom setting and initiate interactions on their own with a larger group so that they can own the learning iteration. Listening to and learning from people around makes an ideal learning environment.

f) Relevance

Courses should address a student's present requirements or gaps in cognition and skills. In order to connect to learners, relevant information and activities for practical application that the learners need must be included. The content should be meaningful and up-to-date to make the course a worthwhile and successful effort for all stakeholders.

VI. FINDINGS

In order to answer my research questions whether learner-centric approach is known to the trainers in the focus group that I contacted and if trainers in question are interested to take a back step and reflect and develop a course based on the new approach, I have taken into consideration some available literature and ideas.

First, the results of the survey of the focus group of life skills trainers:

a) Learner-centric course design awareness of trainers.

20 focus group trainers were surveyed with the help of the below questionnaire:

Survey Questionnaire -Annexure - 1

Pie-Chart - 1
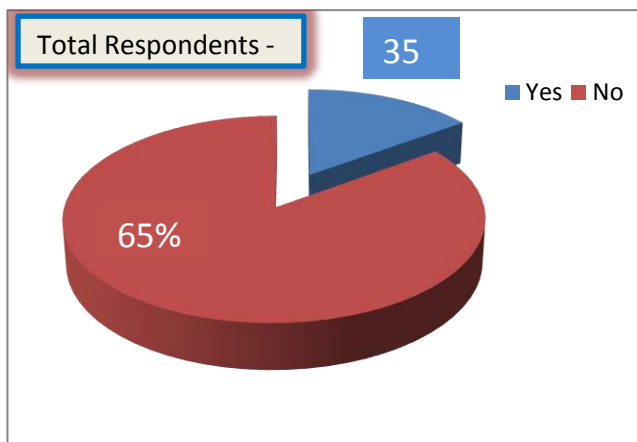
The survey reveals that the awareness level is at 35 % and there is a need for faculty development programs to implement learner-centric model.

b) Desire and intention of trainers to design and deliver the learner-centric course:

Intention to design courses Questionnaire – Annexure - 2

Pie-Chart – 2
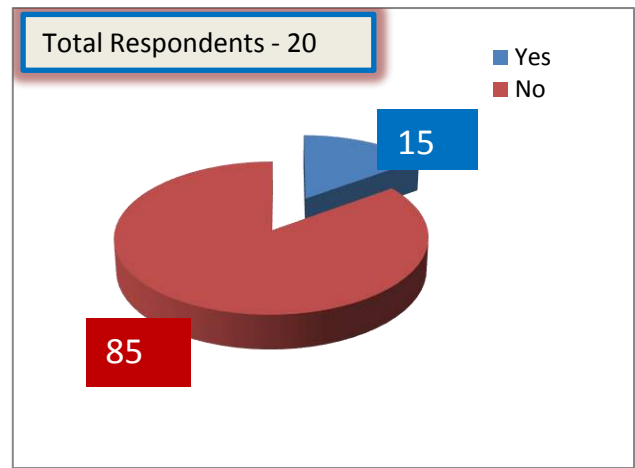
The pie-chart-2 reveals that the intention and desire level is only 15% which means that the trainers need to be motivated and incentivized to take up designing courses and launch online courses of their interest and the interest of the parent institution. A clear cut policy and implementation plan at department levels would be a game changer.

The result of the above task makes it evident that the learner-centric approach to course design is the order of the day. The methods reviewed in the literature review is enlightening and makes for a good read to assimilate it in one's course design.

As for the Moocs or online courses, a trainer can attempt a mini-course to learn the ropes and be ready with the pdfs, videos, and assessment methods and also have a recourse to available authoring tools in the World Wide Web. It really is not a rocket science to use the tools as they are user friendly like any software package of the day.

It is also found that a great deal of planning as a novice course/instructional developer would save precious time and resources and would make the trial and error gap narrower. The point to remember is to make the learners, their needs and motivations relevant, before embarking on the course design journey. It also makes sense for the trainers to become designers for their own good and upgrading into master class educators to the millennials both in

terms of offline / online course content and delivery. We can easily deduce that a small start (drop of water) would make an ocean of difference for the trainers to learn, implement to become course designers under the learner-centric life skills modules. Becoming mooc designer would be a feather in their caps. I also found the effort to understand the whole idea and process to be personally fulfilling and wish to be the trainer that I have detailed above for the readers of this research paper.

VII. ANALYSIS

In tune with the findings of this paper, the trainers who would be motivated to become designers and developers of learner-centric courses must definitely excel in their craft.

It makes sense for them to start with the plan, design and implement based on the aspects detailed above. The readers would really benefit from the encouragement to become significant change agents in the education life cycle.

The department heads and institutions should be requested by the trainers of life skills or other departments to inculcate design thinking of course content and delivery to make the learning and teaching experience go to the next level. All stakeholders would count this journey of learner-centric courses, MOOCs a worthy effort without any side effects and redundancy.

The survey on the focus group shows that the awareness and interest levels of trainers have room for improvement. Like learners, trainers and educators too need learning outcomes with regards to learner-centered approach and online course design. A concerted effort of trainers, department heads and the institution quality set up need a revival in this regard.

To sum up, the center of all MOOC content design is focused on the learner's needs and interests. Learners should engage and connect with the content proactively and should be able to acquire information and application in their own time and space. The learner audience analysis should ensure that the learning needs are personalized and standardized.

VIII. CONCLUSION

The research started with two questions to trainers. Are they aware of learner-centric course design concepts and would they like to take a backward step to fulfill an exciting task of designing learner-centric courses especially in the online mode of MOOCs. In the process we have browsed through and learnt about course design principles, MOOcs design steps, about the mini course flow and elements of a learner-centric course design.

In the literature review we observed that the course designer should consider certain aspects while planning a course. Once this is done one needs to write down the outcomes. Finally, the content must follow the guidelines obtained from the above exercise and materials must be collated and created for offline or online courses respectively.

As we considered whether trainers need to take roles in development of course content, the experts are sure that it is required. The involvement and upgrading of trainers in instructional design skills is the need of the hour.

As regards the MOOCs is concerned, a learner-centric approach would challenge the learners' previous knowledge and make them connect to new learning .In this connection the designer of a course must ensure engagement of the learners .Engagement would be possible if the course is reaching out to the target learners by personalizing to the learning styles (audience analysis should bring this out). Lastly, the relevance of the course must be

catered to in the design stages to plug the knowledge gap and skill requirements of the learners to make it relevant for their real life situations at the present and their near futures.

We can conclude that learner-centric course design needs passion of trainers to connect to learner needs. The best way forward is to design a trainer's own course or in the least effect changes to an existing one to make learning meaningful and effective. The institutions and department heads should encourage them to be course design thinkers.

IX. ANNEXURE

Annexure - 1
Learner-centric course design awareness

Designation	
Institution	

Read each question carefully, and then write T (true) or F (false) on the line given.

1. ____ I understand the learner-centric course design.

2. ____ I don't know what learner-centric means.

3. ____ I design courses based on this model.

4. ____ I create content that is relevant and helpful for learners at present and their future studies and job.

5. ____ The presentation of the content is interesting as per my learners.

6. ____ Learners share that they are better prepared to apply the skills and concepts from the training in practical life.

7. ____ My content challenges the learners to stretch their cognition and skills.

8. ____ The course content that I make makes the learners be active and engage in thought processes and apply learning immediately.

9. ____ The content that I make helps learners to collaborate either in pairs or groups most of the time.

10. ____ The course content I make is usually made to be relevant to the learner's present and near future.

11. ____ Learners have control of their learning in my course design and they become accountable to their learning.

12. ____ I have learnt about my audience and made the courses suit their personal learning styles.

Annexure - 2
Desire to design and deliver the learner-centric course

1. ____ I have learnt about learner-centric methods and have applied it to design my courses.

2. ____ I have read about the learner-centric model and have discussed the same with my peers to implement it.

3. ____ I intend to learn the model and implement in this academic year.

4. ____ I am hard pressed for time to do this and feel the content that I have is sufficient.

5. ____ The content given to me is suitable to all types of students.

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Mind Maps For Effective Learning

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ABSTRACT

This research paper shows how Mind mapping can be used as a graphical demonstration of information and a resourceful tool that can support students with many aspects of their learning. It can help them map new ideas, reconnoiter concepts in more detail and expedite better understanding of relationships and enhance creative learning.

It shows how Mind mapping is one of the superlative ways to capture thoughts and bring them to life in visual form. Mind maps can help students become more imaginative, recollect better and crack problems more efficiently as compared to mere notes making. "Mind mapping has been around since the mid 1970s, having been developed in its current form by Tony Buzan".

Keywords : Mind Mapping, Graphical Demonstration, Resourceful Tool

I. INTRODUCTION

The author observed lack of interest in conventional teaching techniques. Students always look for new ways of learning. Today's generation is more inclined towards graphical presentation and multimedia.

The author's keys objective is to develop interest in students for the subjects and the author observed mind mapping is a powerful tool.

II. OBJECTIVE

To develop a habit of incorporating mind mapping as a regular learning process.

III. RESEARCH QUESTION

Why Mind mapping for learning?

Why do students choose mind mapping activities over others?

IV. METHODOLOGY

This research is built on the author observations of the students of 1st & 3rd semester students for consecutive three semesters (Aug 2018 till Dec 2019). Focused on student's lack of interest in the subject taught with chalk and talk methods.

V. LITERATURE REVIEW

Students learning and understanding can be developed with learning centric approach along with mind mapping and it improves student's imagination and efficiency because it's an exceptional tool to let student create new ideas, identify connections among the different facts and figures, and commendably increase student's memory and retention. (O"Donnell, Dansereau, & Hall, 2002), (Buzan & Buzan, 1993). When used as a part of instruction, these types of mapping techniques have shown to increase student's achievement scores (Horton et al., 1993) and knowledge retention (Nesbit & Adescope, 2006).

Mind mapping is the visual illustration of text content. It has been anticipated as a method to brainstorm and recapitulate information as well as a study method.

Mind maps permit students to generate a visual image to boost their learning (Budd, 2004) and can be used as a metacognitive tool that permits them to make acquaintances to Material in significant ways. Mind map helps in breaking complex information into simple facts & figures. It becomes easy to remember and recall information when required and also to achieve the goals."Ames. C. (1992)". Mind map encourages participation from students and create a healthy competitive environment between them."Budd, J.A (2004)". A mind map give a clear picture and provides guidance to the students in the group to complete a specific task in a project "Ching, C.C., & Kafai, Y.B (2008)".

Mind mapping helps in understanding most complex subject and also helps setting goals in a systematic way. Not only it motivates it also ensure continues learning is encouraged " Deci, E. L .,Ryan, R. M.(1991)

VI. FINDING

· It is found that the students mostly lack interest in subjects and in long term goals, they find it hard to remember and information when it's required like in the exams or while appearing for technical interview drive.

· Due to convention teaching and learning process in the class & outside students look for short-cuts to achieve short team goals like exam and project submission.

· Due to young and creative mind set they look for new ways of learning & sharing information.

· Most of the teaching and learning is done with one motive just to pass the subject. But they forget about understanding the concept completely.

VII. ANALYSIS

According to the findings acquired in this research is aimed to determine the opinions of the college students related to usage of mind maps for better learning.
Mind mapping clearly forms a structure and breaks down information so it could be understood.
As shown in the below figure it clearly supports break all the intricate details of any subject "Vygotsky, L. S. (1978)".

Revise structure:
- Organize content
- Group similar items
- Prioritize main ideas
- Define relationships
- Add emphasis:
  - Colors
  - Shapes
  - Lines
  - Connectors
  - Font style
  - Font size

Add relevant items:
- Ideas
- Data
- Links to sources
- Attachments

ADD

REVISE

ANALYZE

Analyze content:
- Clear?
- Accurate?
- Complete?
- Parsimonious?
- Redundant?

Revise content:
- Delete items
- Modify content
- Reword items
- Combine/condense

Analyze structure:
- Orderly?
- Consistent?
- Logical?
- Intuitive?

It's clear that why mind mapping is required for learning process because it creates a visual demonstration of the information, that helps in understanding and co relating the facts rather than mugging up the notes.

Mind map encourages experiential learning which helps students to get a lot of facts and figures on their own in an interesting and self-explanatory way. It's creates curiosity in learning and also help in remembering information.

Students are benefited as they get the right path or support in recollecting information with mind map. As they work in a team they get involved because they will be clear about every stage of the process in learning and presenting the same. Peer pedagogy: Student collaboration and reflection in a self-learning through mind map.

Students are benefited as they get the right path or support in recollecting information with mind map. As they work in a team they get involved because they will be clear about every stage of the process in learning and presenting the same. Peer pedagogy: Student collaboration and reflection in a self-learning through mind map.

Eencouraging the students to use mind mapping technique for every task he perform. It will help him to master the skills and .be more productive in the learning process.

Mind mapping activity will allows students to quickly engender innovative and even come up with distinctive facts in less time. It will provide the liberty. As it's needed when brainstorming is done in learning process.

Mind mapping will categorize and organize the thoughts you brainstormed and discover their associations. With just single page or space you can present & understand a huge amount of information. Making relations is simpler because all the information about a topic in a single page. It will help students find out new associations between seemingly unrelated information and facts.

Use of Creative ideas like Images, Colors, backgrounds, Animation & Keywords in mind map supports student's memory and retention. It's very difficult to remember information obtain from chalk and talk method. With help of mind map creative style it encourage and helps students spend more time in learning difficult and complex topics.

A Mind Map is a brilliant tool for working with others to expand plans to execute key projects. It allows you to connect to the contribution of all team members.

A Mind Map helps thinking with better clarity to discover associations among information and fundamentals of a disagreement and to create solutions for the problems. It also provides new viewpoint by allowing you to see all the appropriate issues and examine the choices. It also puts together new understanding and systematize facts sensibly with proper structure to find a solution for the problem.

Taking notes with Mind Maps becomes interesting and easy. As a lot of information is feed to all the students every day in form of notes in the class. It becomes a mammoth task to remember all the information, facts and figures and it's not possible to remember them all. So Mind Maps help structuring

the information with help of key words, and making clear and simple associations among essentials information and thoughts visually – keeping it all on one page.

VIII. CONCLUSION

As per the observation mind mapping should be a pre integrated part of learning. It will enable the students to be a better learner and also store information and recollect when it's required. Mind mapping should be a part of teaching methodology because the students understand better and faster than the conventional chalk and talk method.

The way we solve a puzzle by connecting all the links together and understanding the big picture. So the students should break the information and structure the same in form of mind map for better learning.

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How Does Music Help To Improve Effective Communication?

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ABSTRACT

This research paper is aimed at learning communicative skills should spark all your senses, as well as your creative side and help one to try and think of new techniques that can be used in learning. At the Indian Engineering colleges, students are expected to enhance their skills in reading, writing, speaking and listening. Not only studying new English vocabulary but also practicing new English knowledge in a group with friends and classmates. However, there are several additional ways to enhance one's learning process. Music in English will certainly enhance one's language comprehension, improve one's listening skills, increase vocabulary, and help in pronunciation. Music is a fundamental channel of communication: it provides a means by which people can share emotions, intentions, and meanings.

Keywords : Music in English learning, English speaking skills through music, Effective communication and music

I. INTRODUCTION
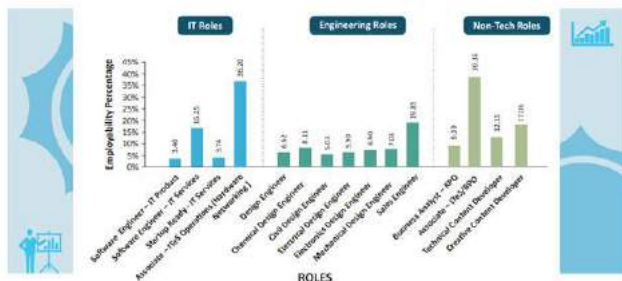
Figure 1: Employability percentage of engineering graduates in different roles

The Economic times newspaper reveals in its Employability Survey 2019:

"Jobs slip away from the ill-equipped Indian engineer. The general quality of India's engineering graduates is exactly where it was a decade ago, with next-gen tech skills still a chimera, the new Annual Employability Survey 2019 by Aspiring Minds has revealed. On top of a shocking series of revelations is the finding that 80% of Indian engineers are not fit for any job in the knowledge economy" [1]

II. THE NEED

Through this survey it is understood that the employability numbers are the same as it was a decade ago. Our engineering students do not have the relevant skills to make a career out of it. Hence, there is a need to equip them to be employable and successful in their professional life. There is a need for cognitive and language skills to be introduced for their career growth.

The time has come that the teachers in the communication department will have to be very creative indeed, or else both content learning and the throughput rate of learners will suffer.

III. RESEARCH

A.   Objective

To introduce music skills for the Engineering students in India enabling them to master English language so that they can enhance their communicative skills which in turn will help them be successful in their professional and social life. The application of song and music as a teaching and learning classroom motivation will result in creative and enhanced language performance.

B.   Research Questions

How do almost all the musicians excel in their communication skills?

How does music help the students improve their communication skills to a greater extent?

C.   Literature review

A research was conducted how to bridge the gap and help Indian Engineering graduates who join the jobseekers' queue in millions every year. The results reveal that these issues will have to be addressed immediately by an initiative which will make students identify their dormant qualities and unused assets so that they can sharpen and get profited by them when they face the challenges in this competitive world.

The survey was conducted with 100 talented musicians in India and around the world and found out how they were able to excel in their communication skills and whether music helped them sharpen their communication skills and gain self-confidence.

90% of the musicians agreed that they improved their communicative skills in English language by music, 6% stayed neutral, leaving 4% to disagree. [2]

https://www.surveymonkey.com/results/SM-NKM9TPDS7/#

The results stress that by music one can improve his English pronunciation, vocabulary, use correct grammar and gain fluency in conversation.

Henry Wadsworth Longfellow, the poet wrote that "Music is the universal language of mankind" in 1835. Though the music we listen to has changed dramatically over the past two centuries, Longfellow's words are probably even more valid in today's life's situations.

Of late, music has become the newly adopted 'teaching methodology' in the department of communication. Music and song, whether pop, rock, rap, rhythm & blues, hip-hop, made it a better place for the learners. Though the teaching and learning lesson plan and assessment is simple, but proves to be very much experimental and practical.

IV. METHODOLOGY

A.   Ethnographic Research and Qualitative Observation

As a part of the process of the research, more than 100 participants, including highly successful Engineers were reached. This was conducted through a survey by surveymonekey.com. The data and related information define the research questions very clearly.

B.   Findings

·   It is found through this study that almost all the musicians who are into different professions agreed that by music they have developed their communicative skills and gained self-confidence.

·   Through music they were able to think in a new way

·   Music was the motivation behind the learning. By the words from the songs they could analyse the meanings and the figurative language could be identified and discussed in the context of the text.

·   The overall singing in a group or a solo developed their Para-language skills like accent,

pitch, volume, speech rate, modulation, fluency, facial expressions, eye movement, tone or voice and hand gestures.

V. ANALYSIS

As a result of Ethnographic research and qualitative observation, it is identified that introducing English learning and sharpening communicative skills through music to the first year Engineering students will be fruitful.

Incorporating and integrating music as a part of engineering curriculum will be helpful to the student community.

A. The plan

Learners choose a song (for example, "Rain drops are falling down and making a joyful sound" by Rollo Dilworth) and learning now is based on how the music lyrics are analyzed. [3]

B. Methodology

The class is conducted in a closed room and music welcomes the learners for about fiteen minutes. Popular music is played to make an impact on the young students. Singing the lyrics is a natural response from them. The classroom will bring an "electric mood" and that learning will have a vibe. Then the words of the lyrics are transferred onto the overhead projector screen. Then the teaching and learning begin. Actually, this is when the teaching and learning continue.

C. Music and learning

A few weeks later, all English language lessons will become increasingly boisterous in a positive way. The motivation is clearly intrinsic, with visible benefits in other learning areas as well. Grammar classes will not be tedious any more. The learners' oral presentations will become more ambitious than expected, with music, songs, and videotaping the sessions will be very interesting. Students long to attend the classes without being absent.

The objective in using music is to motivate the teaching and learning communicative skills. Not only are the lyric productions beyond expectations, but language ability in the written task improves as well. Music will also make the environment more learner-friendly. Music will motivate the learners to go beyond their language limitations and respond. It is confirmed from the survey that music as an innovative teaching and learning intervention which works.

Gradually the oral presentation can be added into this section. For many, their confidence in using their limited knowledge of English visibly grow. The writing task will produce efforts that range from mediocre to outstanding. They can be encouraged to videotape themselves performing their song as part of their presentation.

D. Music and Effective Communication

Language learning has a profound relationship with music in that they can both develop and support each other. They are interdependent.

"Melodic recognition, contour processing, timbre discrimination, rhythm, tonality, prediction, and perception of the sight, sound, and form of symbols in context are required in both music and language" Stan sell [4].

To make the learning of language more effective, traditional language teaching methods will have to be reviewed, and music should be introduced as one means of further enhancing learning. Fluency would be the outcome of merged methods of teaching and learning, together with motivated learners, improved vocabulary development, use of vocabulary in context and communicative confidence, as evidenced by the case study cited. They will have a positive impact on the four key language learning skills: listening, reading as passive skills and writing and speaking as productive skills.

"Researcher Stansell [4] more academically states: "The universal element of music can make the artificial classroom environment into a 'real' experience and make new information meaningful, bringing interest and order to a classroom."

As educators, how can one define the relationship between language learning and music? Oats and Grayson [5] write of language acquisition being rooted in phonology - which consists of symbols that represent the sounds of language, morphology – a form of words establishes meaning and grammatical function, syntax – an order of words constitutes sentence formation and semantics – vocabulary which creates meaning and understanding.

1English pronunciation [6]

Phonetic symbols
used in the dictionary

Consonants								Vowels and diphthongs					
p	pen	/pen/		s	so	/səʊ/		iː	see	/siː/		ʌ	cup	/kʌp/
b	bad	/bæd/		z	zoo	/zuː/		i	happy	/ˈhæpi/		ɜː	bird	/bɜːd/
t	tea	/tiː/		ʃ	shoe	/ʃuː/		ɪ	sit	/sɪt/		ə	about	/əˈbaʊt/
d	did	/dɪd/		ʒ	vision	/ˈvɪʒn/		e	ten	/ten/		eɪ	say	/seɪ/
k	cat	/kæt/		h	hat	/hæt/		æ	cat	/kæt/		əʊ	go	/gəʊ/
g	got	/gɒt/		m	man	/mæn/		ɑː	father	/ˈfɑːðə(r)/		aɪ	five	/faɪv/
tʃ	chain	/tʃeɪn/		n	no	/nəʊ/		ɒ	got	/gɒt/		aʊ	now	/naʊ/
dʒ	jam	/dʒæm/		ŋ	sing	/sɪŋ/		ɔː	saw	/sɔː/		ɔɪ	boy	/bɔɪ/
f	fall	/fɔːl/		l	leg	/leg/		ʊ	put	/pʊt/		ɪə	near	/nɪə(r)/
v	van	/væn/		r	red	/red/		u	actual	/ˈæktʃuəl/		eə	hair	/heə(r)/
θ	thin	/θɪn/		j	yes	/jes/		uː	too	/tuː/		ʊə	pure	/pjʊə(r)/
ð	this	/ðɪs/		w	wet	/wet/								

(r) indicates that British pronunciation will have /r/ only if a vowel sound follows directly; otherwise it is omitted. In American pronunciation, every 'r' of the ordinary spelling is retained.

Songs give you perfect pronunciation models. As you learn to sing them, you are practicing your pronunciation, you are imitating native speakers, and you are learning how to speak better. The rhythm naturally leads to better pronunciation, better intonation, and more fluency.

1) **Listening skills**
When one starts paying attention to the lyrics his listening skills naturally will improve. After learning a few songs, one will start gathering an immense repertoire of songs and vocabulary. This will activate the listening skills and listening to music in English will become an enjoyable learning exercise.

2) **English vocabulary**
When you listen to songs repeatedly the lyrics won't be easily forgotten. It will stay with you and you will really enjoy it. A song a week will fetch you 52 songs in a year which in turn will help you master many vocabularies and phrases.

3) **Correct Collocation**
Stories are told through songs, and through this we learn correct collocation which we hear over and over again and incorporate them into our own way of speaking. Collocation is the cultural context and placement of words. It's what sounds natural to native speakers. It usually doesn't have much logic to it, and it's almost impossible to teach. It is something that's acquired with time and contact with the language in authentic cultural contexts. [7]

E. **The Value of Understanding the Lyrics**
· This study bridges the gap between experimental investigations and applications in the classroom. [8]
· Learning through this method can always begin by choosing the song which they already know and understand.
· Developing the skill-acquisition of learning songs by ear.

· Involves a deep integration of listening, performing, improvising and composing.

· By understanding the lyrics we can demonstrate our paralanguage skills in volume, pitch, modulation, facial expression, eye movement, tone of voice, etc.,

Implementing aspects of this model in the Aural Skills curriculum provides an opportunity to observe our students' learning process in real-time. Although the end goal may be performance based, the emphasis on shared experience and critical thinking encourages the practice of traditional concepts and skills in 'real-life' situations. This presentation will introduce several project-based tasks, share videos, and address challenges in implementation and formal assessment. Hence, learning English music can be a perfectly natural, enjoyable, rich part of your daily life. [10]

F. Music and motivation

The case study indicated that music enhances one's skills in academic achievement, self-esteem, and self-confidence. Music is a means of communication. It is an innate part of a person's being. Depending on taste, it soothes and relaxes, inspires and motivates. Used carefully in the learning situation, it can turn the beat of the learning process around.

Various studies prove that music does contribute to a learner's academic achievement, motivation and creative development. They conclude that music helps one to learn more, and more effectively. Music contributes to all of education. The learner benefits by enhancing key developmental goals such as self-esteem and creativity. [9]

It is common knowledge that Indians have a natural sense of rhythm. For an Indian life skills trainer, this strength should be exploited and developed into a teaching tool that supports the learning of language. It is highly recommended:

· to use music as a complementary method as it makes full use of visual, auditory, movement and tactile senses;

· to introduce simple songs with catchy melody;

· to have music educated teachers in life skills departments, music venues and suitable instruments and equipment,

· to organize music programs that support teachers and students;

· to integrate music into the aspects of skills development;

· to encourage parents to improvise music/sound related activities with their children, for example, family singing, listening to music and doing household chores to music;

· to encourage parents be involved in their student's taste in television and you tube to guide the kind of music and language that influences their listening and speaking

In the education context, it is critical that the educator recognizes the relationship between music, motivation and learning. This case study provides evidence that music actively motivated people to believe in themselves, to take on seemingly difficult learning tasks and to gain confidence. It became clear that being competent in one area and feeling good about one's performance in this area, actually helped learners to cope with weaknesses in other areas. The premise is that if one is good at music, this strength makes up for one's lack of sport, language, academic or social skills. This case study provides actual evidence that music gives academically unsuccessful students a place to succeed. Music then, is a tool for motivation in learning. Music can be effectively used to achieve non-musical goals.

This research makes us understand that music and singing are the integral parts of learning English and it cannot be ignored. Not only are students motivated, but also they are given a learning situation where they can enjoy learning in a relaxed, non-competitive environment. The singing enables

learners to discover language structures and new words incidentally and are able to use them in communicative contexts.

VI. CONCLUSION

In conclusion, the research paper reveals that using songs and music is an innovative teaching tool which will help students come out of the humdrum life style, get interested and involved in learning and practicing language skills. By this process the pessimists get transformed into optimists. This paves way for a positive mind set which will motivate them to take part in language activities like group discussion, presentation, impromptu speeches, and role plays without hesitation. As they overcome self-consciousness and stage fear, an important thing happens here….like a bird which was freed from a cage they fly into a new horizon and enjoy their freedom. They are ready to face the interviews boldly with confidence and get placed. Since their communicative skills are sharpened they will never give up at any point of time. This will certainly make difference in the employment percentage too. This is not only meant for engineering colleges, but also for every educational institution in India, where they want their students to get equipped and be successful in their professional life.

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Role of Technical Students in Owning Up Their Academics

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ABSTRACT

This research paper aims at examining the possibilities of fostering 'Proactive Ownership' among students of technology, in terms of acquiring knowledge and skills, to apply and enhance creativity and not just focus on scoring.

This is an attempt to enable students to participate in active learning and to share the onus of the teacher in creating an environment of application mind set. This is based on the observation of 3rd and 4th semester Engineering students of New Horizon College of Engineering, Bengaluru for five consecutive semesters.

Keywords : Ownership, Engaged Learning, Contribution

I. INTRODUCTION

The author, a Life skills trainer has witnessed a lack of 'Ownership' among the Engineering Students. Most students of engineering courses have been studying their subjects only for scoring marks, so that, the placement department of the college can create opportunities for them to get recruited. They fail to understand that their learning is instrumental in building the nation technically. They seem to outsource the responsibility of scoring marks to their teachers and that of recruitment to the placement department of the college. The author has come across students who yearn for notes instead of learning, who wait for instructions from teachers in terms of assignments and projects instead of carrying out these proactively. The author has also observed the teachers becoming 'Paternalistic Leaders' in terms of making their students 'Do what it takes' to score marks. This parasite mind set of students has drawn the attention of the author to analyse the

'Role of Technical Students in owning up their academics'

II. RESEARCH

A. Objective

To explore the possibilities of developing a set of students with proactive mind set to acquire knowledge and skills and to apply them.

B. Research questions

Should there be a paradigm shift from 'Enforced teaching' to 'Engaged learning' among engineering students of India?

How to make students shift from 'Get' mind set to 'Give' mind set?

C. Literature Review

Dr.Sitaram Soni, Hod, Engineering and Research, ITM University in an article (1), has made valid suggestion to improve the technical teaching and

learning. He is of the opinion that faculty exchange between institutions in India and also between institutions of different countries would always add a healthy competitive spirit among teachers. He also opines that active participation of faculty in seminars conducted by industries would enhance their learning levels in imparting knowledge and skill. Further, he is of the opinion that Engineering faculty should compulsorily write papers and publish them. His suggestion to continuously assess faculty in terms of their teaching, student interaction and research work would also add to quality learning.

Engineering education is application oriented and students are expected to do what it takes to imbibe this into their learning. Addressing this challenge, Terry Heick in his article, Six Strategies for teaching with Bloom's Taxonomy(2), emphasises on teachers' role in creating learner centric classrooms.

His six strategies include :

a) Using all levels of Bloom's Taxonomy in teaching,

b) Starting at lower levels of Blooms' Taxonomy and gradually increasing the level of thought process,

c) Taking the help of technology to teach at level six of Revised Bloom's Taxonomy,

d) Letting the students take a leading role by bringing their ideas to Bloom's framework,

e) Using Bloom's levels from the lower order to higher order in Project based learning and

f) Giving reward points to students as they move higher in Bloom's levels.

It has been observed many a time that students scoring high marks fail miserably in technical interviews where they have to prove their conceptual knowledge. This gap in knowledge and skill can be addressed by good teaching, say Aabha Chaubey, Bani Bhattacharya and Shyamlal Kumardas Mandal(3) They are of the opinion that good teaching depends on "different aspects related to student and teachers like assortment in the infrastructure of the educational institutions,

sociocultural, political and economic factors and the most important is the composition of the class room (gender, social background, ethnicity, etc)". They have categorically stated that, good teaching-learning happens only when the knowledge transfer happens conceptually.

The conceptual learning of technical subjects plays a vital role in shaping an engineering student as a contributor with application knowledge. The new Annual Employability Survey 2019 conducted by Aspiring Minds (4) paints a rather dull picture of this concept. According to the report, 80% of Indian Engineers especially in the IT sector, are not equipped with application skills and the skills that would keep them abreast in the changing world of technology. The report recommends students be given an insight into the job profiles and their own interests to identify the skill gaps and to devise ways to address them. Talking about improving Employability skills, Himanshu Aggarwal, CEO of Aspiring Minds, in an interview with Nisha, Abraham Bijeesh, proposes an approach "to create an ecosystem to help identify employability gaps, provide quantitative and qualitative feedback at various levels be it an individual, institutional, regional or national level to help bridge the employability gap in a constructive manner"

In this regard, a report (5) submitted to the NITI AYOG (Erstwhile PLANNING COMMISSION) New Delhi on the basis of the study supported by the Research Division, NITI Ayog and conducted by S.V. University, Tirupati, comes out with 41 suggestions to check and improve employability of engineering students at different levels. On page 85 and 86, the report proposes 41 suggestions which include measures like, increasing funds to be given to institutions, improving infrastructure, rewarding students and also training faculty periodically.

Furthermore, one can take note of Alok Choudhary's words in his article in Youth Ki Awaz 2 years ago, where he voiced his concerns on the

raising need for corporates to retrain the fresh technical graduates after they are absorbed. He attributes lack of skills in freshly graduated students to the flaws in the design of curriculum and inclusion of subjects that are redundant in industry. He further talks about the option of open electives which would generate interest among students to learn technology the way it has to be learnt.

These discussions do point to the lack of interest to learn technology, the application way, among students, which leads to the skill gap and brings down the employability ratio. The Mission10x framework by Wipro (6) approaches the problem from the angle of innovative teaching techniques and tools that would enable students to

· "Imbibe higher levels of understanding of engineering courses
· Effectively apply the learnt concepts in practical situations
· Develop key behavioral skills required for employability"

This approach is built with a focus on Taxonomy of educational objectives by Benjamin S. Bloom and Multiple Intelligence Theory by Howard Gardner.

This programme is given as Faculty Development Programme across engineering colleges of India with an idea to develop 'Learning Centric' environment among students by creating interest through activity based learning.

Moving away from teachers' onus to create learning centric classrooms, Mckinsey in their work 'Education to Employment'(7) have discussed the skill building problem from the employer's perspective, where they have identified three segments of employers. The first segment which believed in interaction with institutions and students in terms of offering time, skills and money had the privilege of getting the required talent while the other two segments had to struggle for the same.

To sum up the findings from the above survey, it is found that it is the teacher, the education system or the industry which actually takes the ownership of building employability among students through learning centric classrooms. The question, this author wishes to address is, why shouldn't the students, being adults, exhibit ownership and do what it takes to learn technology the way it has to be learnt i.e. to apply, to contribute and to build

III. METHODOLOGY AND FINDINGS

This discussion is based on the author's observation of 3rd and 4th semester students' involvement in completing their technical graduation. The author has come across students whose mind set is just to get the required marks to get through their semesters and to sit for placements. This factor is evident through their lethargic approach to submission of assignments, participation in projects, seeking internships etc., The author has had students asking for notes, important questions, pattern of question paper etc., rather than understanding the concepts. In fact, the assignments are submitted after a lot of procrastination and reminders from the teachers. The preparation time of students for examinations is observed to be 1-2 days before internal tests or examinations. The author has, in fact, run behind the students to make them do their assignments for marks, to take up their tests etc., All the above observations have led to the author's thought process expressed in this write up.

IV. ANALYSIS

Technical Education by most Indian parents has always been perceived as lucrative means to livelihood as against an opportunity to contribute. This mind set of 'Get' over 'Give' which has percolated its way through to the youngsters has resulted in them developing aspirations only to Get and not much in terms of Give. It has also been observed by the author that most of the technical

students select Engineering courses mainly due to Parental pressure, Peer pressure or for the simple fact that they are not aware of the other courses available. The aspirations of such students normally revolve round the translation of their efforts into a lucrative job. The fact that every academic course is designed to enable a student to gain expertise in the chosen area for the main purpose of contribution followed in the second place by rewards, has lost its recognition. The latin term'Quid Pro Quo' meaning in contractual terms, 'Mutual consideration' has been applied here as mere 'Job for marks' than 'Contribution for rewards'. The paradigm shift of technical student from being 'Vidyarthi'(Knowledge seeker) to 'Udyogarthi'(Job seeker) has made the technical education completely marks oriented.

A marks oriented directs his efforts towards successfully getting scores. This score may not always result in comprehending the teaching, mainly for the purpose of application. The interest of a student in getting notes, important questions etc., is always at a much higher level than the interest to learn, apply and contribute. The term 'Learning Curve' translates into a mere marks oriented approach where the student simply 'memorises' the facts that can fetch him or her marks.

At this juncture, the teacher who observes lack of 'engaged learning' will compulsorily resort to 'enforced teaching'. The ownership of developing contributing engineers now lies with the teachers and they start devising ways to make the actual learning happen. They start creating learning opportunities for their students through assignments, projects, workshops and seminars etc., which are again perceived by students as things that are enforced on them. The author has witnessed a behavioural pattern here, where most of the students comprehend such activities as just means to enhance their scoring and resort to last minute copying from friends and internet. The author has also come across a practice where the submission happens only after repeated requests from teachers. Here again, the

'transactional method' of leadership comes into picture where the teachers have to offer the reward of marks or the penalty of not allowing participation in placement.

Upon reflecting on the aforesaid observations, the author is of the opinion that technical students will understand the importance of 'application oriented learning' only when they are made to understand the expectations of the industry from them. These expectations, if understood properly, may push them to shift their focus on being a Vidyarthi before being a Udyogaarthi. In all probability, students will get moulded by the second of the 7 habits of highly effective people as stated by Stephen Covey. They start visualising the end, the job role, the responsibilities thereof and orient their learning from marks to application. They aspire meaningfully and set proper goals for themselves. This, in turn will nurture passion, create 'Ownership' to acquire skill to contribute. The same can be illustrated with the help of the following figure:

Figure 1.

Developing ownership with Industry Interface

When the students are made to understand their contribution area in their professional life, they would naturally do a SWOT analysis of themselves and map their interests to expectations. Students who aspire to work in a specific job role after understanding the relevant responsibilities, would definitely make efforts to understand and learn the subjects with application mind set. This practice becomes a habit as they visualise the end of their efforts and own up their studies accordingly. They become proactive, do not wait for instructions, are curious and do what it takes to reach their goal. Those students, who see a mismatch between

industry expectations and their own capabilities will own up their aspirations to do something else where they can be successful.

V. RECOMMENDATIONS

Students benefit to a great extent by the following activities:

a. Career guidance programmes by industry experts to set expectations from the fresh graduates

b. Effective usage of Centres of Excellence set up by institutions to interact with industry people

c. Internships at the end of every semester – this can go hand in hand with Bloom's Taxonomy i.e. the first internship to make them memorise their responsibilities, the second to make them understand that they need to be revenue generators, the third to introduce them to application of their learning so on and so forth.

VI. CONCLUSION

The conclusion is, through these activities, the students are made to understand the levels at which they are expected to perform, especially the part where they need to be revenue generators for their employer. This is when the skill gap analysis happens, the responsibility and the accountability set in, and students stop outsourcing the work of making them knowledgeable and skilful to others, especially teachers. The behaviour pattern of the students shifts from reactive to proactive. Passion leads to higher levels of contribution.

Now, the question to ponder – at what level should the industries take initiative, to make the students understand their expectations – immediately after 10 or 12?

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Building Vision Skill – A Single 'Upskilling' attribute that enables numerous Employability and Leadership Skills in the Community of First-Year Engineering Students in India

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ABSTRACT

An ability to define a vision and execute the relevant strategies is identified as the core requirement for the first year Engineering Students. This ability will aid in understanding the ever-changing Job market, building employability skills and preparing them corporate ready.

The SLN Vision Execution Program (SVEP) is a strategic process that instigates a Vision Skill in 1st year Engineering Students. SVEP model covers three core areas such as 'SMART Goal Setting & Execution,' 'Emotional Intelligence and Management,' and 'Leadership Capability Building based on Personality.' The primary emphasis in the SVEP model is given to build an ability in 1st Engineering students to define the vision, develop strategies to execute the vision and continuously monitor and measure the results for corrective actions. SVEP also aims at making the 1st year engineering students more responsible and accountable as capable learners with heightened self-confidence and self-awareness. Moreover, the SVEP model constructs the solid foundation and empower the students 'corporate-ready' when they complete the curriculum. The model is designed considering the rapidly changing business environment, the technological interventions, future trends and market trajectory. Ethnographic Research and Qualitative Observation methods aided in defining and analyzing the research questions and designing the program. The notes from the interactions with the students, faculties and placement teams, most importantly, with the fresher corporate employees and the feedback from HR and hiring managers helped in designing the model.

This paper addresses the importance of building vision skill using SVEP and how it can be used as an 'upskilling' tool to build numerous life, employability and leadership capabilities. The paper also includes the structure of the SVEP model, key areas being addressed during the program and the impact. The discussion covers the practical deliberations and, how the program complements the existing curriculum and the fields required for further advancement and evaluation.

Keywords : Vision, SMART Goal Setting, EQ, Leadership, Employability Skill

I. INTRODUCTION

The high-level of discussions and researches are conducted in technical education and related investments in India. The report authored by Mr. KVR Mohan Reddy, chairman and committee member of AICTE – All India Council for Technical Education – points out a huge gap in capacity

utilization in the education sector which is as low as 49.8%. The committee has assessed the Capacity Vs Enrollment based on numerous assessments and reports on technology, jobs and skills, and future educational trends. The AICTE report suggests not to make any investment in capacity planning, starting from the year 2020. The report stresses that, among various other requirements, the employability of graduating students is one of the critical variables in reaping huge ROI on technical education investments in India [1]. Hence, the educational institutes and respective decision-making bodies must give utmost importance to employability gaps in engineering colleges.

This research paper addresses a critical capability – vision skill – which can be the best possible solution to tackle the employability issues persisting among engineering graduates.

'Vision' here is an ability to achieve a long term growth by continually building the required skills and capabilities based on the changing business climate and global economic scenario. Due to the digital occupancy and technological necessity on the businesses, one must also comprehend that the long term career goal in this era means keeping a goal that can be achieved in '4-5' years. Along with the fluctuations in the business market, the definition of 'vision' also is changing.

Keeping a long term goal to achieve in 10 or 15 years has become 'null', and 'void' as the business functions and strategies face persistent modifications. The technological developments not only bring in new products and services but also change the way the existing ones behave. Many new technologies have destroyed existing products as well. The cutting-edge new technologies quickly emerge and create an upskilling demand, in spite of engineering stream the students have chosen [2]. For example, a student who has chosen 'civil engineering' must look at improving his/her 'project management' skills to start the career, survive and succeed in this agile era.

At the same time, the options are plenty for engineering students to hone their passion in the current job market. The recent interaction with the first-year Engineering students revealed their passion towards a 'start-up' environment, 2 out of 100 students developed a 'software' addressing specific problem areas that they had identified. When their ability to market research and the selling the product was questioned, they showcased a lack of clarity on how to build a business around their passion. Likewise, there were approximately 17 students who wanted to pursue masters in universities outside India. When they were questioned about their areas of interest, knowledge on specific geography where they can pursue masters with the right ROI, they were clueless. The unrealistic and unplanned actions often lead to unexpected results, the students tend to return to what they know without any further exploration to fulfil their wishes, and the goals remain as mere dreams. This paper covers the core tools which can help the students to consistently achieve growth.

To summarize, Vision is an ability to set a long term goal and establish a target to achieve in 4-5 years. Hence, it becomes pertinent for the 1st year engineering students to have a Vision when they start their vocational course so that they can work on a success formula and stand unique among peers. Vision skill is a learned skill. The students can be trained on Vision skill by facilitating programs focusing on building solid knowledge, defining a goal, creating the framework, most importantly, developing methodologies to appropriately execute the strategies. The SVEP model's vision strategy includes the tracking mechanism, measuring the progress and taking corrective actions based on the changes happening in the industry.

The Vision strategy starts with setting up a SMART goal. George T. Doran coined the acronym while publishing a paper on "There's an S – M – A – R – T way to write Management's Goals and Objectives" in November 1981 [3]. This paper further

includes how SVEP helps to set a SMART Goal to forecast the future by defining the Vision Statement. The process to achieve the SMART goal in SVEP will help in continuously acquiring the right skill sets and capabilities to achieve professional growth.

Apart from defining and executing the strategies to achieve the goal, there are two key areas where the 1st year students need to build expertise. As the world is becoming highly technology-oriented, psychologists predict numerous negative impact it is going to create on the emotional health of humans [4]. The Vision strategy must address the emotional well-being of the students. The emotional

Intelligence and management part of the SVEP addresses the attributes on personal growth.

The definition of leadership is changing, along with business expectations. The best leaders are self-aware, understand where to invest their time and how to utilize their strength to reap significant returns. The best leaders know the art of seeking help. They periodically assess to find the areas of improvement to continuously grow and reach out to the mentors for help [5]. Moreover, there are various leadership styles one can adopt based on personality. As India is growing in Entrepreneurship and global business forum, each student must develop many leadership attributes based on their personality and strength. SVEP addresses specific leadership styles identifying strategies so that the students can steadily achieve financial growth as well.

II. RESEARCH

A. Objective

To develop an explanatory theory that associates the structure of building Vision Skill for 1st year engineering students studying in India, so that they can achieve personal, professional and financial growth by enhancing 'corporate readiness'.

B. Research Questions

What are the critical reasons for engineering students struggling to adapt to the changing business environment and technological interventions?

Why is the employability of engineering students limited in spite of being put through several corporate ready programs?

C. Literature Review

The Employability Survey 2019 [7] conducted by Aspiring Minds concludes that 80% of engineers from India are considered 'unfit' for any jobs in the Industry. This is the fifth edition of the National Employability Report for Engineers where the data is widely used in leading research papers and quoted by Indian Government agencies like NITI Aayog, HRD Ministry and AICTE. This report assesses the skill gaps and the necessary measures to mitigate the challenges. This report also reveals that only 2.5% of Engineers possess AI skills, 1.5% - 4.5% possess data engineering skills and 2.8%- 5.3% possess wireless technology skills. While considering the critical employability skills, only 1.5% possess cognitive and language capabilities, which are crucial in the industries.

The report from Aspiring Mind stresses the importance of preparedness level of the Engineering students to face the Next-Generation technology and other core life skills as described in the introduction section in this paper. The Ministry of HRD, AICTE, in its report authored by its Chairman Mr. BVR Mohan Reddy, refers employability reports generated from Aspiring Minds to conduct further

Research on capacity planning and technical education growth in India [1].

When there is no 'vision' skill, the students' focus remains on 'studying for scoring' than 'learning for growth.' The academic adjustments in the 1st year student's life majorly depend on the socio-economic status, emotional intelligence, the family support and

many similar factors. The journal article by Dr. Paras Jain, the director of Silicobyte Katni Degree College, states that the adjustment pattern is solely depending on the individual intelligence level. He cites that the family issues, academic pattern changes, environment, new faculties and moreover, the distinct personality make a considerable difference in their adjustment levels [8]. Many educational institutes organize training sessions & mentorship programs for the students. The placement ratio post-session is often considered as the measuring parameter to assess the impact of such programs. Since the programs focus on third or final year students, such programs work well majorly on the students with self-driven attitude. Dennis Congos, the academic advisor, University of Central Florida concludes that the low morale and inability to assess their capabilities are the few reasons behind the underestimation of 'Vision' skill among student community [9].

There are also various researches globally in the area of emotional health among 1st year engineering students. The study conducted in Istanbul by Mustafa Bahar among high and low achievers in college entrants and the impact on their psychology and educational patterns shows that both sets of students showed concern about the negative impact [10] due to heterogeneous grouping. After studying and living in a homogenous grouping and transforming into the heterogeneous grouping, the studies show a more negative effect on their psychology. The test involved 200 men and women, all engineering students. It is observed that the high performing students during school days showed poor performance in the 1st year engineering. The report concluded that there was a strong correlation (p = 0.000) between the motivational factors and academic performance [11]. Similarly, in India, the faculties observed similar pattern in the students as well. The students work hard while accomplishing secondary and higher secondary education, where getting entry into engineering colleges become an achievement. The transformation to a new group

indeed brings in new form of anxiety and hard feelings. Such emotional management requirements need attention and care.

With the advancements happening in the technological and digital area, the changes happening in the business environment is becoming numerously unpredictable. Due to which, the job market is also facing a turbulent climatic situation. It becomes imperative for the first-year engineering students to forecast the employability options when they pass out from their respective courses after 4 years. Moreover, leadership skills are highly in demand. The visioning capability will help hugely here to set a clear goal, develop action points as a

Leader based on personality and strategies to continuously assess and build necessary skills to start, survive and succeed in their life.

III. METHODOLOGY

A. Ethnographic Research and Qualitative Observation

As a part of the process to create SVEP, approximately 100 participants, including engineering students from first to fourth-year batches, placement cells in educational institutes, fresher engineering students and HR & hiring managers were interviewed. The variables were collated as a part of numerous training and workshops conducted for Engineering students and fresher employees. The training needs analysis and interaction before conducting sessions on career growth, goal setting, emotional management and leadership-building workshops are used as critical parameters. The behavioural observation and feedback collated post sessions showed a significant difference in candidates towards achieving sustainable growth. The data and related notes from such interaction, observation and feedback forms are considered as core variables to define the research questions and write this research paper.

B. Findings

·   It is found that the students lack clarity in their career goals, follow either herd mentality or make hasty career decisions without vision skill. The interaction with the freshers further reveals that the thought process towards career and growth tend to occur only when they are in their 3rd or 4th academic year. That too, while engaging themselves in internship or attending campus or off-campus interviews.

·   Due to high-level stress to accomplish the educational requirements and getting placed in the right job, they feel pressurized and highly anxious. The anxiety leads them to upskill through training programs in a random manner irrespective of the career options they want to pursue. The time, effort and cost involved in these processes without any ROI further lead to enhanced guilt and anxiety. Apart from the stress involved in learning and settling down in the new job, the responsibility to manage the educational loan, marriage, family pressure further put excess stress, in turn, leading to emotional and mental health issues.

·   The initiatives taken by the educational institutes to connect the students with the corporate often becomes a one-way communication, where the students feel more confused than getting any clarity. The industry knowledge, opportunity to interact with the employers and the awareness on various roles are either minimal or nil. Moreover, most of the educational institutes and the students focus on building employability skills when the Engineering students are in the third or final year. The campus placements are considered more an institutional obligation where the institute is ranked based on the number of campus placement and the average salary package obtained. Due to the challenging globalization and substantial job opportunities in the IT industry, the hiring team is looking for new ways to recruit talents [6].

·   Most of the campus ready programs focus on developing specific technical and soft skills instead of providing a holistic approach to what an individual would require. The lack of a holistic approach leads to limited personalized career planning and guidance to execute the strategy. Such path leads to further confusion and anxiety among students. The emotional management of engineering students is neither recognized nor addressed.

·   To Summarize, the engineering students undergo campus ready programs and identify the areas of improvement to be 'corporate ready' either in 3rd or 4th year. Due to the pressure to complete the academic requirements, related industry projects and internships, the students get minimal to nil time to equip themselves with the necessary skills before joining the organisation.

·   As a result of Ethnographic and qualitative observation research methodologies, it is identified that building a 'vision' skill is critical when the Engineering students are in the first year itself. The organisations striving to make the changes in the year-old recruitment system is the indication for the necessity to upgrade the current engineering educational curriculum. Further research on this thought process helped in bringing out the treasure load of life skills that the students will develop when they undergo sessions as a part of SVEP. Integrating the Vision skill as a part of the Engineering curriculum will hugely help the student community.

IV. ANALYSIS

The Vision Execution Program (SVEP) from SLN Brand Studio brings solutions to address the research questions defined above. The program starts with setting a SMART goal, leading the students to not only set a goal but also to design actionable strategies to achieve the same. To bring-in all-inclusive solution, the program leads to guiding the students with tools for addressing various emotional managing requirements. Moreover, the program assures that the students understand, learn and build the appropriate leadership skills based on their personality type, strengths and areas of improvement.

At the end of the program, the students become completely equipped with heightened confidence,

wholesome clarity on their future and better aware of how to study during the academic years. Specifically, the awareness as a self- help tool to consciously define the methodologies to be in touch with the industry, consciously adapt to the changes, identify the right upskilling requirements and continue to grow.

A.   Smart Goal Setting

Smart is the acronym for Specific, Measurable, Achievable, Realistic, and Time-bound. The goal set by the 1st year students must be SMART. In normal circumstances, the engineering students have the aim of getting placed in a specific set of companies or proceeding with higher studies or starting a business or engaging in a family business.
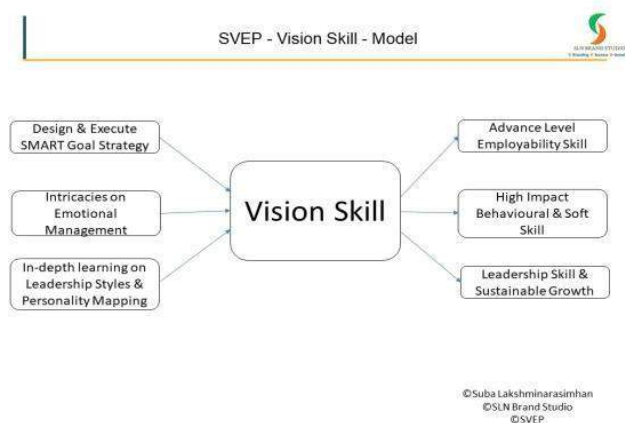
Fig 1 – SVEP – Vision Execution Program Model

As an example, the student can aim at getting placed in a specific company or an industry after completing the 4-year degree. Unlike earlier times, today's job market offers various opportunities, be it an established organisation or a growing start-up or a new start-up. Overall, the expectation of the organization differs based on its growth stage. To bring in better focus, the start-up environment expects students to perform beyond technical roles. They are expected to be on their toes all the time, possess problem- solving skills, and better flexibility [12]. Since the early stage start-ups have a small team, the students will be put in a situation where they are monitored every minute. If the vision is 'working in a start-up,' they must execute strategies to develop specific skills such as growth mindset, sales & social

media knowledge and C-suite interaction. Most importantly, they should be willing to wear multiple hats and grow a thick skin to handle high-level pressure associated with the role [13]. Whereas, the more prominent organisations require a different set of skills and expertise. People management is a crucial skill that the students must develop if they aspire to work in an established and global organisation.

The research report from the 'Aspiring Minds' observed that 62% of students wanted to work in larger organisations [7]. The reports also show a significant difference in the way the students from tier1 and tier2 cities think and aspire. The tier2 students showed less interest to work in larger organisations fearing the probability of getting a job. This is where the goal-setting process helps enormously. If the student from Tier 2 city aspires to work in a larger organisation, setting a SMART Goal in the 1st year, executing the strategies to achieve the same appropriately will help in developing the key employability skills. The below session uses the same example to explain the SMART goal setting, and the process goes as below.

A student from the Tier 2 city with limited industry exposure sets a goal to get a job in an established MNC in 4th year. Such goal becomes specific, measurable, achievable, realistic and time-bound. It is distinct because the student has better clarity on working in a precise company. When the same goal is set to achieve in 3 or 4 years down the line, the student is expected not only to set the target but also to execute the strategies to achieve the same.
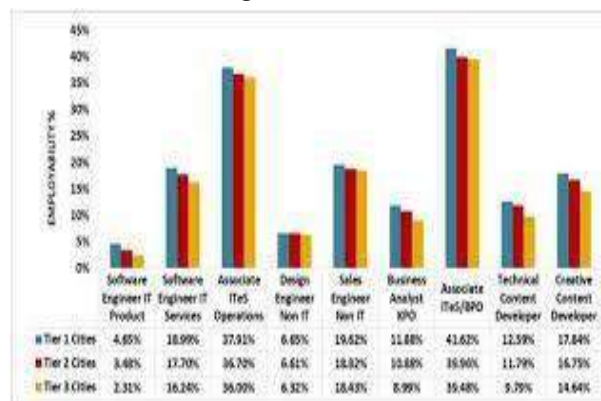
Fig 2 Source: Aspiring Minds, "National Employability Report, Engineers, Annual Report 2019,"

When the criteria such as 'specific' and 'time-bound' are met, the goal becomes measurable, achievable and realistic. The measurement process in SVEP puts the student in a better place to assess and address the skill gaps in a well- planned manner. The students continue to evaluate and map the skills with the real-time expectation of that specific company, keep upskilling and make it achievable. Working towards such goals give better exposure to various industries so that the student has better clarity on what is expected in each sector. They also understand whether their goal aligns well with their personality. In case of any mismatches, the student has enough time to take corrective action in the goal-setting process.

To summarize, the goal-setting process makes them realize their strengths, areas to improve, which also helps them to plan their future accurately. The significant advantages for a student here are:

1)   Life Skills and Team Effort: Whatever be the goal, irrespective of the organisational size, even as an Individual contributor, the employees are expected to possess 'team effort' as a critical capability. When the students realise the importance of team effort, it reflects tremendously in the way they look at the academics and other core soft skills. Beyond improving life skills such as Listening, Communication, Listening Skill, Collaboration, Interpersonal, Problem-solving, and Conflict Management, the team effort also helps the students work in cross-functional and cross-cultural scenarios.

a)   Listening Skill, Listening is one of the core skills to make students employable. Listening skill requires high energy and complete focus, which ultimately helps the students to work in a cross-cultural organizational structure. The process of SMART Goal Setting in SVEP, irrespective of job seeking or higher studies as the goal, involves honing the listening skill. The capability built to improve listening skill leads to enhanced communication, interpersonal, problem-solving and conflict management skills.

b)   Impact of Soft Skill: The soft skills or life skills help the students to consciously understand the theoretical knowledge of an academic field, apply practical and operational expertise in real-time organisational scenarios, and build an ability to improve social intelligence too [14]. When the students set the goal, they learn the intricacies involved in achieving the same.

For example, when a student wants to join a specific Industry, he/she understands the importance of building a network and learning through them. The processes lead them to create an opportunity where they shadow a job or do an internship. When they are put in a corporate environment while studying itself, they learn to work in a team. Such work scenarios further help them to assess their key strengths and areas of improvement. The defined areas of development become the objectives or short term goals for them to achieve.

2)   Habit-Forming: Habit-forming is a behaviour building exercise which is critical for the first-year students. The transition from a school student to a college-goer at times dilutes the seriousness they have had in professional life as well. The first year is the period the students get exposed to a different sort of freedom and massive social media influence. Notably, due to the demand sought in schools following the Indian education system, after completion of the school curriculum, students feel very relaxed as they enter into college. Even though the Engineering education demands for better academic performance, due to peer pressure and the change in thought process the individual student possess. As mentioned earlier, the high performing school students perform miserably in the colleges [10].

The goal-setting process will help in habit-forming as well. The behaviorists define habit-forming as the instinct that motivates a human being to experience fresher perspectives. Habits bring uniformity, synchronize the thoughts & actions, facilitate the performance, induce interest in certain life occurrences and make things happen with ease. The execution of action plans in the goal-setting process ultimately depends on 'habit-forming'. When it becomes habitual for the students to use the skills acquired in and around their campus life, they achieve wholesome learning experience. Else, the skills remain merely as 'skills' not an 'expertise.'

The SMART goal-setting process helps in building and measuring physiological aspects of habit-forming to enhance motor skills and personality development. If we consider life skill acquisition as 'learning through classroom sessions,' the 'habit forming' ability becomes 'a practical approach' to use the capabilities earned. To summarize, the well-structured SMART goal setting process along with the execution strategies will help the first-year students to set the foundation firmly with clarity in thoughts.

B. Emotional Intelligence and Management

The emotional well-being or the psychological health of the students is one critical area to address in building a healthier future generation. Many types of research are conducted in terms of various psychological attributes such as positive mindset, resilience, happiness, which are also believed to be the critical tools for achieving growth.

When it comes to 1st year Engineering students, they undergo numerous psychological ups and downs. The expectation from parents, educational institutes and the overall society take a multitude of shades that put undue pressure on the students. Suddenly, they are treated as 'adults.'.'

Not all the students come with the mental strength to handle such pressures, responsibilities and changes overall. As stated in the Journal from IJRAR, the psychological well-being is composed of a person's ability to live peacefully, in spite of pleasant and infrequent unpleasant occurring and life satisfaction index [17]. Moreover, according to the Schlossberg transition theory, self- identification is cited as three sequential processes such as 'moving in,' 'moving through' and 'moving out.'

The theory states that the initial years of undergraduates push additional responsibilities related to self-management and finance. Along with such transition, they venture into the unknown circle, and the academic stress takes a new shape. This is considered as the 'moving in' phase. The adaptation to the new environment, getting comfortable with the experiences are put under 'moving through' phase [18]. This is where imbibing 'Vision' skill will give a hand. The emotional management training as a part of Vision skill acquisition will help the students to face the demands from the academic institutions and building team effort for better productivity during the college/university years.

The emotional intelligence expert Daniel Goleman defines it as 'the capability for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships.' He keeps stressing the fact that the EQ differentiates the 'star' performer from the other average and low performers. The emotional intelligence and the way the performers behave through self-awareness and social awareness values higher compared to the ability to apply core technical knowledge on the job [19].

The higher EQ can be learned by integrating the right methodology and learning processes. The emotional intelligence strengthens persistence, enhances positive thought process, elevates curiosity, and brings in collaborative behaviour and build trust among the student community and with the society [20].

For example, while learning through the Vision Execution program (SVEP), when the students identify 'building a network' as a critical skill to be imbibed as a part of 'vision achieving' process, they will definitely push themselves to determine the comfortable ways to build a network. Here, the 'compulsion' to associate in an unknown circle becomes a 'favorable choice' the students make to succeed. Such emotional management techniques will help the students to bind with an act its significances, which further encourage them to act repeatedly. Likewise, each critical emotional management attributes such as resilience, empathy can be built through self-awareness, awareness about others and the overall living scenario.

C.   Leadership Capability Building based on Personality

The definition of leadership is rapidly changing. When the term ROI is connected with Leadership, it is defined as 'Return on Integrity.' Integrity is determined by the core values a leader possesses. As John. G. Blumberg mentioned in his book 'Return on Integrity: The New Definition of ROI and Why Leaders Need to Know it,' the mission here is to define the values at the core. One can become a leader by utilizing his/her core personality as a leader. The program focuses on building a Vision Skill where the students identify their leadership style, advantages, disadvantages and the risk factors associated with each style. The SMART goal-setting process helps in defining the core values the individual students possess and the 'Leadership Capability Building' model helps in mapping such core personality with the various leadership styles. Moreover, they will also learn methods to adapt to the required changes to utilize their strength appropriately.

The process starts exploring various leadership styles, the characteristics, measurement tools and personality mapping. The researchers and authors have segregated leadership styles based on variables defined through their researches, studies and experience. Mark Andrew Muphy, the author and an expert on organizational leadership segregates leadership as Idealists, Steward and Diplomat. This segregation is defined based on a study conducted with more than 300,000 leaders. The modern leadership styles, such as 'thought leadership,' 'transformational leadership,' 'strategic leadership,' and 'servant leadership' prompt businesses to think, learn and act in various growth perspectives. If the personality of a student connects with the characteristics of thought leadership, he or she gains strategic visibility, exposure for newer ideas, reliable authority and build connectivity with the right network.

The traditional and contemporary researches have paved a way to numerous fool-proof methods to identify the personality of an individual connecting with personal and professional growth. Some of the most popular personality assessment techniques are MBTI (Myers-Briggs Type Indicator), Neo Pi-R, 16 PF, Eysenck Personality Questionnaire and MMPI/MMPI-2. SVEP utilizes one of the personality assessment methods for further mapping and Leadership style determination.

When the students identify specific leadership style mapping with their personality and the ways to make the better use of it in the first year itself, it gives them sufficient time to practice before they get into corporate/business

Structure. The Experiential Learning Theory (ELT) defined by David A. Kolb, integrates the common themes in work into a systematic framework that addresses various 21st- century requirements for professional growth. Since Experiential learning contrasts with classroom-style learning, the 1st year engineering students are directly in contact with the reality of the situation which can have higher impact and perform better when they get into real-time projects, internships and job shadowing opportunities. Such experiential learning method

helps hugely in building organizational awareness and social responsibility.

V. CONCLUSION

This research paper analyzed the reasons behind the employability skill gaps among engineering students and addressed the requirements to be implemented to mitigate the weaknesses. One of the core gaps assessed is the low impact of corporate ready programs on engineering students, primarily because of the execution of such programs towards the end of the academic period. The sub-gaps are the atomistic approach of the existing 'corporate ready' programs and the inability to give personalized guidance towards the student's growth.

SVEP, the Vision Execution Program from SLN Brand Studio can be amalgamated with the current curriculum in Engineering colleges and universities. The focus of SVEP starts with the first-year engineering students, that too, with a process of setting a SMART goal. The structure of SVEP begins with providing personalized goal-setting strategy where the foundation is placed on the characteristics, their existing strengths and weaknesses. As a part of the goal-setting process, the students build a holistic career growth plan and the required life skills to support the execution and continuous measuring process. Measuring growth periodically is an integral part of the entire process. The process definition, implementation and measurement encourage the students to build another essential skill, which is 'habit-forming.' This module focuses on designing the professional growth strategy for the 1st year engineering students.

SVEP's second most crucial module is identifying and addressing the emotional needs of engineering students in 1st year. The interfering factors impacting the emotional and mental health of the students are discussed in this paper. It is the responsibility of the educational institutes and universities to help students identify, share and seek

help on emotional issues in the early stages. This module focuses on designing the personal growth strategy for the 1st year engineering students.

SVEP's third module focuses on empowering students with leadership skills. As discussed in this paper, the random skill development and mapping it with the leadership ability might induce insecurity and anxiety among students. It is critical to identify the right personality type and map it with the leadership style. This module exposes the students to various leadership styles and encourages them to adapt to the style that suits their Personality. The principal objective of this module is to empower the students to achieve financial growth.

The artificial intelligence, machine learning and other similar technological advancements are going to pose enormous challenges for organisations. The organisations work towards changing their working and hiring methodologies, especially towards engineering graduates. The educational institutes and the universities are expected to adapt to such changes and continue to build the rightly skilled engineering student community. While coping up with the organisational challenges and placement issues, it is also the responsibility of the educational institutes to take care of the emotional health and develop holistic growth opportunities to the students.

Do the existing curriculum in engineering colleges address the critical problems discussed in this research paper? Isn't it time to execute a co-curriculum strategy that provides measurable results?

SLN's Vision Execution Program Model represents the depiction of how the Vision Execution program from SLN Brand Studio connects different variables to achieve the Vision Skill in 1st year Engineering Students. SVEP provides a solution to address the problems stated in this paper using a holistic approach where a personalized career growth strategy can be implemented in each students' life. The best part of the SVEP model is that the

components can be well blended with the existing curriculum, by collaborating with the educational institutes and faculties. The integration will definitely pave way for further research and solutions that can elevate the student community and the overall education sector. The execution of this program empowers the student community by addressing the personal, professional and financial growth requirements.

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License Plate Recognition and Detection using Machine Learning

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ABSTRACT

Building an effective tactic to identify characters from images with fewer error rate is the big task. Aim of this paper is to furnish an algorithm to generate error free recognition of text from the given input image and also it help in document digitizing and prevention to the hand written text recognition. Optical Character Recognition is the intensive research topic for more than 4 decades, it is the time consuming and labor intensive work of inputting the data through keyboard. Hence this paper discusses about mechanical or electronic conversion of scanned images, text which contain graphics, image captured by camera, scanned images and the recognition of images where characters may be broken or smeared . The optical character recognition is the desktop based application developed using Java IDE and mysql as a database. The proposed algorithm gained 93.42% accuracy when applied on different data sets. In pre-processing and post processing neural network techniques are used to remove noise from the image and classification are used to recognized the characters. Back propagation algorithm are used for the training of neural network, feature extraction has performed by template matching and hamming distance.

Keywords : OCR, Classification, Propagation algorithm

I. INTRODUCTION

Automatic License Plate Recognition is an important problem in Computer Vision and Image processing. There are many applications ranging from complex security systems to common areas and from parking admission to traffic control. Automatic license plate recognition is a complexity task due to diverse effects such as of light and speed of the vehicle. In this work, we explore the methods to detect number plate in a frame using machine learning methods. Image processing techniques are applied to filter objects for number plate and trained model is used to detect number plates.

This makes the automatic License Plate (LP) detection and recognition crucial and inevitable in the system of LP extraction. There are two separate processes: LP detection and LP recognition. Different algorithms, system and techniques have worked out and applied to both of them. Moreover, the previously image processing developed concepts of or other concepts are applied in order to get more accuracy. However, there is still room for improvement. Although some studies have been performed on LP detection and recognition, this research work is different from the previous ones due to a number of reasons. Nevertheless, in major researches, a neural network or a deep learning system is used only in the detection or recognition

process. The novelty of this work is that our system uses a few pre-processing steps to classify LPs / non LPs utilizing a first Convolution Neural Network (CNN) model for LP detection.

The purpose of this paper is to explain the implementation of our project, "Advanced License Plate Recognition". This report will begin with sections on motivation, past projects, and constraints. It will then proceed to describe our system in broad terms to provide a general overview of our project to the reader. It will then describe each subsystem in detail. For each subsystem, we have included explanations for why we chose our methods, performance of our methods, under what conditions would our methods fail, and how can we improve our methods.

II. RELATED WORK

Belongie and al. [1] used shape descriptors, called "context shapes", to describe the distribution of the forms relative to a given point on the contour. Seeking the correspondence between two forms was then equivalent to finding the point on the other form that had a "shape context" similar to each point on a shape.

Carmichael et al. [2] showed the variation of the context shapes in order to differentiate between the form and the content. Another approach utilized morphological operations on gray-scale images [3]. On the other hand, the authors of [4,5] combined a contour detector with morphological operations to search the rectangles that were considered a candidate LP.

Kim and al. [6] proposed a method based on the extraction of the contour to localize an LP on images taken in low light conditions. In [7], the authors put forward a method for the detection of the LP of a vehicle image with a complex background. They used the histogram equalization to find the threshold in order to improve the quality of the image that

contained the LP. Furthermore, the LP color can be different and few regions may have specific colors. For that reason, some authors used a color-based approach to extract LPs by localizing their colors in the image.

The authors [8] [9] checked a test image using a color-model classifier. In addition, the authors in [10] segmented color images by way of a shift algorithm into candidate regions. The latter were then classified as with or without an LP.

The authors put forward [11] a fuzzy logic method to recognize LP colors. The LP extraction utilizing color information detect inclined and deformed LPs. On the other hand, this method would be sensitive to some different illumination alteration and would suffer from false positives, mainly in case the other parts of testing images had similar colors of LPs.

The color based approach has diverse benefits such as detecting inclined and deformed LPs, but it is perceptive for multiple elucidation environments. However, this appears to be unproductive when the plate has different colors and patterns.

All the methods and techniques used in paste to automatically detect a number plate are obsolete and outdated. Techniques 'Morphology-based', 'Edge-detection' and 'Image saliency detection are prone to being affected adversely by common obstacles in recognizing a number plate such as bad weather, poor lighting, visual occlusion, orientation, placement of number plate, speed of vehicle, blur, damaged plates, angles of camera, color of number plate and different fonts used for the characters. This calls for the implementation of better and advanced techniques to develop a system which is more robust with higher accuracy.

III. PROPOSED SYSTEM

The proposed system is an automatic and mechanized license and number plate recognition

system which can extract the license plate number of the vehicles passing through a given location using image processing algorithms. Using special cameras, the system takes pictures from each passing vehicle and forwards the image to the computer for being processed by the LPR software. Plate recognition software uses different algorithms such as localization, orientation, normalization, segmentation and finally optical character recognition (OCR). The resulting data is applied to compare with the records on a database. Experimental results reveal that the presented system successfully detect and recognize the vehicle number plate on real images. This system can also be used for security and traffic control.

The paper also proposes an overview of the system for LP detection and recognition. This system is divided into three sub categories: (i) LP detection, (ii) character segmentation and (iii) recognition.
The main advantages are, reduced number of false positives compared to the right results,increased accuracy and efficiency, compared to the older models, removes irrelevant information and reduces noise and eliminates human interaction and makes system fully automatic.

IV. IMPLEMENTATION

The method being implemented has two main processes or separate modules – 'License Plate Detection' and 'License Plate Recognition'.Initially, the collection and training of data is implemented using various, sophisticated machine learning models to detect a license plate. Few pre-processing steps[1] are devised to classify License Plates and Non-License Plates utilizing a first Convolution Neural Network (CNN) model. The Region-of-interest (ROI) or the relevant region containing the license plate is then cropped for further processing. Segmentation and Optical character recognition(OCR) are used to classify and recognize the characters and digits from the License Plate. This stage also employs a secondary CNN for recognition of characters.The

extracted characters are then used to get the particulars of the vehicle and the vendor which is used to implement various functionality in domains pertaining to parking management, traffic monitoring and security systems.

OBJECT DETECTION MODULE

The module used to detect the license plate from the live video feed or a footage. The module uses the Tensorflow and OpenCV to have a human eye perspective.The model used in object detection needs to be fast as system takes data in real time. The object detection models are usually heavy, so we are using One Stage method. SSD – Single Shot Multibox Detector is one of the One stage method used in the System.Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos. Well-researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance.

SSD (SINGLE SHOT MULTIBOX DETECTOR)

SSD is designed for object detection in real-time. Faster R-CNN uses a region proposal network to create boundary boxes and utilizes those boxes to classify objects. While it is considered the start-of-the-art in accuracy, the whole process runs at 7 frames per second. Far below what a real- time processing needs. SSD speeds up the process by eliminating the need of the region proposal network. To recover the drop in accuracy, SSD applies a few improvements including multi-scale features and default boxes. These improvements allow SSD to match the Faster R-CNN's accuracy using lower resolution images, which further pushes the speed higher. According to the following comparison, it achieves the real-time processing speed and even beats the accuracy of the Faster R-CNN. (Accuracy is measured as the mean average precision mAP: the precision of the predictions.)

The SSD object detection composes of 2 parts:
· Extract feature maps, and
· Apply convolution filters to detect objects.
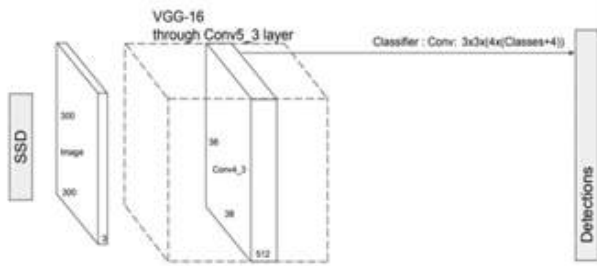
Fig-4.1: SSD: Single Shot Multi box Detector

SSD uses VGG16 to extract feature maps. Then it detects objects using the Conv4_3 layer. For illustration, we draw the Conv4_3 to be 8 × 8 spatially (it should be 38 × 38). For each cell (also called location), it makes 4 object predictions. Each prediction composes of a boundary box and 21 scores for each class (one extra class for no object), and we pick the highest score as the class for the bounded object. Conv4_3 makes a total of 38 × 38 × 4 predictions: four predictions per cell regardless of the depth of the feature maps. As expected, many predictions contain no object. SSD reserves a class "0" to indicate it has no objects.

OCR – OPTICAL CHARACTER RECOGNITION MODULE

OCR, is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine encoded text, whether from a scanned document [7], a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example from a television broadcast).Widely   used as a form of information entry from printed paper of data records – whether passport documents, invoices, bank statements, computerised receipts, business cards, mail, printouts of static-data, or any suitable documentation – it is a common method of digitising. Printed texts can be electronically edited, searched, stored compactly, displayed on-line, and used in machine processes

such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining[9]. OCR is a field of research in pattern recognition, artificial intelligence and computer visions.

V. CONCLUSION

Developed a prototype of the working model as the initial milestone. Successfully compiled a robust , all-in-one dataset from merging various datasets to filter the relevant training examples. Trained our own model from scratch to detect number plates from an image given as an input. Used 'SSMD' based model for number plate detection after trying out with various other models like yolo v2,yolo and faster-rcnn. Implemented and experimented with new techniques to optimize the code and reach the end result. Created a database which stored the authorized users and their details to crosscheck the owners which is scalable and easy to modify. Achieved an average accuracy of > 95%, with the major problematic areas being with [8/B] , [0/O/D] , [5/S] .

Future Work
Will be able to achieve higher accuracy by training the model for specific font and characters, for example, specifically for Indian number plate dataset. Country wise configuration with a detailed approach about the specific scenarios would yield better results and accuracy. Improvement of detection and recognition accuracy can be done using a wide range of training data taken from a high quality source. Additional light and sound sensors can be implemented for greater impact and awareness of the vehicle owner and also the security/admin. Will be able to implement the project as a part of traffic surveillance system and also in the unmanned, restricted parking domain, once it has been made fully robust by using top notch hardware for recording the live feed and processing it.

Association Rule Based Recommendation System Using Mapreduce

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ABSTRACT

Recommender systems are integral part of any ecommerce store in order to withstand and compete with other growing businesses. There are various recommendation techniques which are used to appropriately recommend a product to the active user. The recommendation system has to analyze large amount of data to provide better recommendation and such important issue can be addressed using Hadoop ecosystem. In this paper, a recommendation system for product based on Hadoop framework is proposed. The proposed system recommend products to the user depending on the products present in the user cart. First, it uses framework to import the product transactions. Furthermore, the Apriori for finding frequent itemsets and Association rules are implemented in Hadoop and processing the data using MapReduce.

Keywords : Recommendation system, Apriori, Frequent itemsets, Association rule.

I. INTRODUCTION

The effectiveness of a product recommendation system for a particular active user is very significant in today's world. Two types of recommendations can be provided: personalized recommendations and non-personalized recommendations. Examples of personalized recommendations are the 'People you may know' section based on mutual friends in Facebook or the 'Recommended videos' section based on the previous browsing history in Youtube. Examples of non-personalized recommendations are the hotel recommendations, movie recommendations which are based on other similar users' interest. Recommendation systems uses the features of information retrieval and using data mining techniques. These recommendation carry out in three steps: data pre-processing, data analysis and result interpretation.[1] Recommendation systems

are portion of information filtering system which recommends information items, social objects based on the user's interest. These systems have changed the technique the user look for information and product. [2] It is a matter of custom-made, interesting and usefulness that separates the recommendation systems from information filtering system or search engines. [3]

Recommendation systems are stated as scheme which recommends the products to particular user by considering the user's interest and recommending items on prediction based on items, users and item user interaction. The main aim of recommendation systems is to lower the information overload issue by providing user needed information from huge amount of data. [4] From the definition of recommendation system it says the basic unit of each and every recommendation system which takes user

preferences and by evaluating it helps in predicting the products to the user. [5]

One major problem with recommendation systems is to combine different recommendation systems in order to attain high performance. Each and every recommendation systems have advantages and disadvantages in which disadvantages can be reduced by merging features of different systems [3].

This paper presents an overview of some of the recommendation system techniques which can be used in various applications for the purpose of appropriate recommendations. Further explained the proposed system aims at implementing a product recommendation system, which appropriately recommends products to the active user. When a user logs in through an ecommerce web portal and begins shopping, depending on the products present in the cart, the system analyses and recommends the products accordingly. To make our system scalable, we use the Apriori algorithm implemented as a MapReduce program for processing the Big Data on HDFS. We also show that the proposed recommendation system solves the coldstart problem, which is a drawback of all the existing recommendation systems mentioned above. Unlike the medium to large retailers, small retailers have certain limitations like small data pools and limited computing resources. Hence, the algorithms used to process the continuously growing data should support scalability in large amounts. The proposed system, aims to use the Hadoop environment and the MapReduce concepts.

II. RELATED WORK

There are many recommendation algorithms that are commonly used. For example content-based recommendation, collaborative-filtering recommendation, association rule- based recommendation, utility-based recommendation and knowledge-based recommendation.

The Product recommendation system requires the interaction of the retailer, all of the retailer's past customer base and the active customer who has currently made a selection for his or her shopping cart. [1] The retailer wishes to accurately predict which product recommendation will be most likely to result in the active customer making an extra purchase during this current transaction. In order for a small retailer to implement a product recommendation system such system must be efficient when running on a server machine with modest computing capability, as small businesses normally do not have the financial capacity to invest in a large infrastructure.

Location aware Recommendation system user are associated with a home city, and alert friends when visiting a location by checking in the application. during check in user can also write reviews which are free text notes describing what they liked about the location. The user reviews about items in a location have been utilized to model the data .The spatial user rating for spatial items are extracted such as user id, user location, rating, item, item-location, reviews. Each user visit is mapped to a single location based rating.[5]

Location Based Context Aware Recommender System dealing with a data mining based approach named as Preference oriented location based search (POLS) to efficiently search k nearby stores that are preferred by the user based on the user's location, query time and preference. In POLS, two preference learning algorithms are proposed that automatically learns user preference and ranking function is also proposed to rank the nearby stores based on the user's location, query time and preference knowledge-based recommendation recommend items based on specific domain knowledge about how certain item features meet the user needs and preferences and utility, how the item is useful for the user. Knowledge based recommender system are case based. In this, similarity function estimates how much the user needs match the recommendation.

This architecture consists of a user interface model a interface engine, acknowledge base of the product domain, a customer database. The user interface module interacts with users. It asks users about what features of the product they need and collects the answes from the users.to the user ,recommendation system appear as a guided interrogation supported by the image that illustrate the answer alternatives.

Hybrid Product Recommender System propose a recommender system based on RFID technology for VIP customers in apparel retailing store.[2] The application of the recommender system will improve the quality of customer service via automatically generating of recommender list from the view of customers' interests. The contents in the list may guide the shop assistant to know what kind of products may interest the customer, and the assistant could introduce the corresponding products to the customer based on the recommender list. In apparel retailing stores, new shopping experience provided to customers such as automatic product recommender could improve the brand loyalty.

Content-based recommendation is one of the oldest recommendation system technique. To recommend an item using a content based recommendation system, a user profile is first generated. This profile is built using the data that the user provides. The user may either provide the data explicitly(rating an item) or implicitly(clicking on a link). This data is then processed, interpreted and organised into relevant information so as to generate the corresponding user profile. Once the user profile is built, the content based recommendation system analyses the contents/features of the items along with the information in the user profile and then recommends a similar non-rated item from the retailer's database, that might be of interest for that particular user.

Usually Collaborative recommender system recommends choices to people based on the opinions of other people who have similar taste. The customer gets recommendations that he/she hasn't rated previously, but that were rated by his/her neighborhood. Basically aggregation of ratings giving by the people (neighborhood) is done, identify similarities based on their ratings available and recommendation is provided. In this paper, a performance enhancement of content-based filtering using diverse collaborative prediction. Especially in movie domain, where there are multiple releases of movies every day, acquiring enough ratings so as to recommend movies to other users is very difficult. Hence collaborative method becomes inefficient. On the other hand, using content-based method and recommending movies similar to the one the user has rated before tends to be inefficient too. Since, we want a system that works efficiently in both condition. [9]

III. PROPOSED METHOD

User adds products to the cart. Based on the products that are frequently purchased and the products that are currently present in the cart will be displayed as recommendations for the active user on the same web page.Registration is done using the web application, customer enters his personal information like name, Mobile number and password.

The customer adds products to the shopping cart on the e- commerce website. The product ids of these products in the cart are passed to the PHP module. The flat file where the association rules are stored, is searched for the corresponding rule whose antecedent matches the product ids in the cart. If a match is found, the product ids from the respective consequent part of the rule is returned. These returned product ids are queried from the product database to fetch the product details of these products which are then displayed as recommendations to the active user. [13]
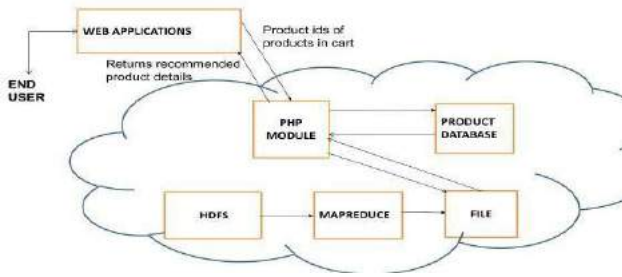
Fig. 1 System Architecture

Caching Association Rules

A Cron job that runs periodically calls a PHP function which invokes the Java MapReduce jobs that compute association rules. The output from these MapReduce jobs are the association rules which are stored in a flat file. This caching of association rules at different intervals of time rather than executing the MapReduce jobs to generate association rules every time a user adds products to the cart improves the performance of the recommendation system.

Association Rules Extraction

HDFS file contains the transaction data of all the previous transactions done in an e-commerce store. It is given as the input to the FrequentItemsetMapper function which is a mapper function written in Java that produces [key,value] pairs where, key is the product id or product ids and value is set to 1.After this step, shuffling of the [key,value] pairs is done thereby, rearranging the [key,value] pairs according to the increasing order of the keys.

The output of the shuffling process is given as the input to the FrequentItemsetReducer function which is a reducer function that calculates and updates the value attribute of the [key,value] pairs based on the number of times [key,value] pairs are repeated. It further eliminates the [key,value] pairs whose value attribute is below the minimum threshold value.AssociationRuleMapper and AssociationRuleReducer functions compare the frequent itemsets to the transactions and builds rules which have a confidence of more than threshold of

0.5 and the output of the above process is stored in flat file.[15]

IV. EXPECTED OUTCOME

On successful registration or login, the user is redirected to the Home Page of the e-commerce website. The page is divided into three sections. There is a section where the list of products that are available are displayed. The two other sections display a cart and the recommendations.

User can shop by adding the products to the cart. When the user adds products to the cart, the recommendations are displayed in the recommendation section of the Home page. The user has added toothbrush to his cart. Hence, toothpaste is shown as recommendation to the user which is the appropriate recommendation as per the association rules generated using the previous transaction data. When user clicks on the checkout button, he is redirected to the checkout page where the user has to enter the shipping address to complete the transaction.After the user clicks on place order, the order is confirmed and the confirmation page displays the order confirmation message. A new record is added to the Transaction.

The accurate product recommendations were made even to a first time user. Therefore, the proposed recommendation system solves the cold-start problem. The proposed recommendation system is scalable and also performs better than the existing recommendation systems. However, it does not provide personalised recommendations as per the user's preferences. Due to this, accuracy of recommendations is low when compared to collaborative recommendation system. The proposed recommendation system can hence be combined with Collaborative recommendation system to form a Hybrid recommendation system. This will solve the cold-start problem which is a major drawback of collaborative recommendation system. The proposed recommendation system can be used to display the

recommendations to the user until a model of the user's preferences is built. Once the model of user's preferences is built, Collaborative recommendation system can be used to display the recommendations.table of the database and the MapReduce Job is run to generate the updated Association rules.

V. CONCLUSION

Recommendation system is an innovative interactive technology for fetching information that can provide a different platform for growth by assisting customer in searching items of their need on the basis of their environment and behaviour. Recommendations on item set that occurs frequently will add new demission by providing associativity in item (or any subset) occur at least as frequently. Associated items in an item set will provide scope for recommending item set to a customer in place of individual items by helping customers to find products which they want to buy plus enabling then to pick product which they must buy. Conversely, they also help business by generating more sales, increasing their revenue.

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Automotive Industry Redefined By Information Technology: Review

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ABSTRACT

At the dawn of second automobile century, the competitiveness among various automotive companies is decided by the very fact that how competent are they in adapting to changing advancement in information and technology. In today's day and age, technology is at work when we drive a car, when we buy one, when we interact with the dealer and is an integral part in research and development. Information and technology has become an important part of automobile firms starting from its design to performing various analysis virtually which has brought down lead time to a fraction of what they were and enabling engineers to innovate and improve with greater ease. With issues such as global warming, depleting natural resources, the responsibilities of firms have increased exponentially in the last decade and the contribution of Information science towards it by the means of data provided is second to none.

Keywords : component, formatting, style, styling, insert

I. INTRODUCTION

The IT industry is one of the largest in the world. It has its presence everywhere and the main reason for this is; it helps to meet particular demands of the field. India is expected to emerge as the world's third largest passenger vehicle market by 2021. Hitting that mark will depend on the better advancement of information technology especially in the field of Big Data and Analytics, Simulation, Robotics and Augmented reality. Cars are becoming large smart devices with mapping capabilities and braking capabilities with the kind of advancement that has happened in the past decade in these fields. Industry 4.0 considers it as four main pillars.

Being able to design the product without having to put in huge monetary investment or resources is a blessing mainly because it's not only efficient but precious natural resources are taken care from depleting. The software solutions eliminate the need for multiple prototypes as well as reduce the risk of product recalls, it is expected that the demand for these solutions will increase many folds in the near future. This will create a height in the demand for computer aided engineering. Any major automotive manufacturer must integrate multiple web based sales channels with its mainframe production line and order management system to reap the benefit from the customer end. For this to happen efficiently, the data analytics has to be taken care with lot more priority.

II. FOUR PILLARS

A. Simulation

In today's day and age it has become a norm in every automation company that any new equipment purchased or manufactured above a certain value should be verified by simulation modelling like CAE(Computer Aided Engineering) and CFD(Computational Fluid Dynamics) to name a few. The conceptual phase error removal and for a better lead time in analysis simulation has played a huge role. From a conceptual design point to final modelling can be realised in virtual mode which in turn is not only efficient but has played a huge role in avoiding natural resources depletion. Simulation model life cycle has helped automotive firms for better design and decision making. Whether a particular design works or not can be identified at the earliest stage which in turn saves lot of time and money.

Using simulation tools a car design of any possible diversity is checked for crash analysis, fatigue analysis, NVH (Noise Vibration and Harshness) analysis and various load case analysis. By knowing the behaviour of cars at the design phase itself with the above mentioned analysis, the materials that are considered for the manufacturing has been reinvented for its particular usage. Reinforced plastics and fibres are examples of it[1]. This helps in handling of physical resources in a better way keeping financial constraints in mind.

B. Big data and Analytics

Big data is helping the automotive industry in many ways from enhancing vehicle safety to the ultimate customer satisfaction. It has helped the car makers to provide customised approach to the customers. It gives a personalised flavour of design and interior to the customers[4]. The data analytics has modified the very nature of working in automobile industry especially in the field of retail norms. The data analytics has forced the firms to come out of their past glory of advertisement and marketing and use a customised approach to impress the customers. For example Audi has collaborated with Adobe for not only maintaining its website and corporate information but also to provide a new brand experience for the visitors. The main contribution of the data analytics is it has helped the firms to understand what customer is searching for and deliver accordingly.

The data accumulated from the various sensors present in the car acts as an eye opener in passenger and vehicle safety. This has formed the core of predictive analysis. Mapping technology has helped in the safety of the customers and in following traffic norms. Product recall from the distributed market is a nightmare for any firm. Forecasting and predictive nature of data analytics is helping to combat them. OEMs (Original Equipment Manufacturers) are able to track their customers even after sale. The data generated about driving behaviour, speed and abiding by the traffic norms is used to create driver profiles. The advanced analytics which uses the data gathered from survey and through feedbacks from the customers has helped the firms to keep up with the latest designs and trends.

C. Robotics

In an era which has been witnessing striking advances in artificial intelligence and machine learning the global automotive industry has embraced the emergence of industrial robots[2]. All the leading automobile players are concentrating in robotic technology to simplify the automation task. Robots have been extensively used in almost all the automobile industry where there is hazardous working environment and it cannot be avoided. Because of the efficiency most of the auto-makers prefer robotic intervention in their production and assembly lines. It has been a proven fact that the utilization of industrial robots has revamped the production and assembly lines. The magical robotic arm has 100% accuracy. Bottle neck removing and protecting workers have been the main advantage.

The rapid adoption of the robotic arm by the auto-makers to enhance the efficiency and precision of production lines will result in further more growth of robotics market[1].

D. Augmented Reality

Augmented reality supports human workers in frequently changing work environment. It provides spatially registered information to perform task directly in the users field. Artificial Intelligence and Machine Learning has played an immense role in the development of virtual reality. Augmented reality guides the user through unfamiliar task and helps in visualizing information. It helps in data visualization and interaction[1][3]. It can create a local environment where an individual can be helped to drive a car. This avoids amateur road accidents. It acts as a 'human- machine' interface. The first IAR(Industrial Augmented Reality) systems were mostly experimental but in the last decade it is used for relevant commercial initiatives. Google glasses are a significant example. The Augmented Reality system is widely used to monitor video see through applications[5].

III. CONCLUSION

With too much of data available, the interpretation of the data for meaningful insights is a big challenge for the automobile industries. Though computational methods for analysis gives us a fair bit of idea about the design, still greater work has to be done to gather further more reliable information. Big Data works on the principal of no data is less. With all the development in informational technology, it has become the responsibility of every auto-maker to shift the interest of the customers from non-renewable source of energy to the environmental friendlier cars. This has resulted in increasing automobile industries to show their interest towards hybrid and electrical vehicles. Such changes are likely to be beneficial for both drivers and manufactures.

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Enhancement of Signature Schemes for Heightening Security in Blockchain

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ABSTRACT

Blockchain has become one of the most pioneering technologies, with the rise of Bitcoin, blockchain which is the core technology of Bitcoin has received increasing attention. There are multiple signature scheme based on digital signature schemes that supports making signatures on many different messages generated by many different users, the size of the signature could be shortened by compressing multiple signatures into a single signature. Based on the blockchain architecture and existing Merkle tree based signature schemes, In this paper, an analysis of how to enhance the signature schemes to secure the transactions on blockchain based on extensible post-quantum (PQ) resistant digital signature scheme best suited to blockchain and distributed ledger technologies is proposed.

I. INTRODUCTION

Recent advances in quantum computing and the threat this poses to classical cryptography has increased the interest in PQ research. More specifically, due to Shor's algorithm [1], a quantum computer could easily factor a big integer in polynomial time, thus effectively break RSA. Implementations of Shor's algorithm can also solve discrete logarithms and render today's digital signatures, such as DSA, ECDSA and EdDSA, useless[2].

The race to build quantum computers has already begun and companies like Google, Microsoft, IBM, D-Wave and Intel are at the forefront. That being said, we have yet to build a computer with the thousands of stable qubits that are required to make classical public key cryptography obsolete. However, there is significant progress in the field and some

optimistic predictions estimate that a large quantum computer capable of breaking asymmetric cryptography might be available in the next10to20years[3],[4].

The security impact of breaking public key cryptography would be tremendous, as almost everything from HTTPS, VPN and PKI in general, is basing their authentication, key exchange and digital signatures on the security of RSA or Elliptic Curve Cryptography (ECC). Blockchains would be hit equally hard resulting in broken keys that hold coins/assets, and would perhaps be one of the most affected sectors because there is economic incentive for hackers to get access to blockchain accounts anonymously.

To address the concern of compromised keys, PQ cryptog- raphy is dealing with the design and evaluation of systems that will survive the quantum

supremacy. An enhancedsolution is a modified version of the hash-based XMSS [5] family of schemes. It practically makes use of a single authentication path; thus, it is a chain and not a tree and it mainly focuses on {one and limited}-time keys, which is usually the most applicable to blockchains as we want to preserve anonymity and minimisetracking.

Compared to existing schemes, the approach outperforms limited-time schemes when required to sign only once or afew times. Unlike one-time schemes (OTS), this schemes provide a fallback mechanism to easily support many-time signatures. Moreover, the underlying logic of a "blockchained" authentication path could be applied to convert any existing hash-based scheme to a {one and/or few}-time optimise done. To our knowledge, this is the first signature scheme that can utilise an existing blockchainor graph structure to reduce the signature cost to one OTS, even when we plan to sign many times. This makes existing many-time stateful signature schemes obsolete for blockchain applications. Moreover, the scheme is solely based on hash functions and that no special math theory is required for its implementation makes it a promising candidate for existing or new blockchain applications, and for low-end devices, such as in IoT applications, where hashing operations are already implemented and sometimeshardware optimized.

II. HASH FUNCTION IN BLOCKCHAINS

A cryptographic hash function is an algorithm that maps data ofarbitrary size to a fixed size string. Two security requirements namedone-wayness and collision-resistance are usually required for hash functions. The former ensures that the underlying hash function is notinvertible, while the latter implies that it is not easy to find two inputshaving the same hash value. For a hash function withn-bit length out-put, the complexities of breaking one wayness and finding a collisionare respectively bounded by $O(2n)$brute force attack and $O(2n/2)$birth day attack. Therefore, for ensuring at least 80-bit security, the output length of hash functions should be at least 160 bits. The most popular hash function used in blockchains is SHA256, which is one of the algorithms from a family of cryptographic hash functions named SHA (Secure Hash Algorithms). SHA is a U.S. Federal Information Processing Standard, and most of the algorithms in this family, including SHA0 (published in 1993), SHA1 (published in1995), SHA2 (published in 2001) are designed by the United StatesNational Security Agency (NSA). While SHA3 (published in 2014) isoriginal from Keccak proposed by (Bertoni et al., 2010), and only thepadding method is modified by the National Institute of Standards andTechnology(NIST).To satisfythe current security requirement, SHA2 and SHA3 are recommendedfor using in blockchains and cryptocurrencies.

III. DIGITAL SIGNATURES

Besides the hash function, the digital signature is another inevitablecryptographic primitive in blockchains. The concept of the digital signature was put forward by Diffie and Hellman in 1976 when they openedthe gate of public key cryptography (Diffie and Hellman, 1976). As abasic primitive of cryptography, digital signature is used for ensuringthe source authentication (Lin et al., 2018), source non-repudiation andintegrity. The standard security of the digital signature is existentialunforgeability against adaptively chosen messages attacks (EUF-CMA),which guarantees that the adversarycannot forge a valid signature on anew message, even if it can access the signing oracle that could providethe signing service.ECDSA (Certicom-Research, 2000)andEdDSA(Bernstein et al.,2011) are the two digital signature schemes frequently used inblockchains. In principle, both of them are based on the hardness ofthe elliptic curve version of discrete logarithm problem. ECDSA worksover a general elliptic curve and now is used in Bitcoin and Ethereum,whileEdDSA works over a (twisted) Edward curve and now is usedin Naïve coin and

Monero. The Edward curve is a plane model of anelliptic curve and has better efficiency and security than a generalelliptic curve. Thus, it has been already selected as the next ellipticcurve generation of TLS by Internet Research Professional WorkingGroup.

IV. SPECIAL SIGNATURE PRIMITIVES FOR BLOCKCHAINS

To enhance the privacy and anonymity of transactions, someadvanced signature primitives such as ring signature and multi-signature are also widely applied in blockchains

4.1 Ring signatures

Anonymity is always required in information systems (Shen et al.,2018), especially in the e-cash system. However, Bitcoin can only provide pseudonymity due to the linkability of transactions. Therefore,many new alternative cryptocurrencies have been proposed to addressthis problem. From a perspective of cryptography, there are many kindsof signatures for achieving anonymity, such as blind signature (Chaum,1982), ring signature (Rivest et al., 2001), group signature (ChaumandvanHeyst, 1991)andDC-nets(Chaum, 1988). However, only ring signature and its variants have been used in blockchains for anonymity.The concept of ring signature was proposed in 2001 by Rivest,Shamir and Tauman (Rivest et al., 2001).Onecanusearing signature scheme to sign messages on behalf of a group including him-self/herself without revealing himself/herself, while he/she can compose this group without other group members' permission. Besidesthe existential unforgeability, the unconditional anonymity is anotherimportant security requirement for ring signature. This new propertycan be divided into two sub-properties: untraceability and unlinkability. The former means that one cannot identify the signer, while thelatter says that no one can decide whether two signatures are generatedby the same signer. The unconditional anonymity is a strong security notion that would be a double edged sword: On one hand, it providesperfect privacy protection towards individual signing behavior. On theother hand, it could be abused for some illegal purpose such as washtrading. Therefore, some restrictions on anonymity should be taken intoconsideration. In fact, even ten years before the concept of ring signature, Chaum (Chaum and van Heyst, 1991) proposed the concept ofgroup signature, which allows a group member to anonymously sign amessage on behalf of the group, with the restriction that a designatedgroup manager is able to identify the signer whenever it is necessary.One of the main differences between group signature and ring signaturelies in that the ring structure is an ad hoc group that can be formed in anon the-fly manner, while the group structure is formed under the control of the group manager. Furthermore, anyone who wants to adjointhe group has to at first perform a registration process — either onlineor offline.In 2004, Liu et al. (Liu et al., 2004) proposed a linkable spontaneous anonymousgroup(LSAG) signature scheme, which is essentiallyalinkable ringsignature considering the spontaneous group formationand no group manager (Sun et al., 2017). Recently, Liu et al.'s ideawas adopted by Back (Back, 2015) in designing Ring-Coin with necessary improvements in efficiency. Along with another line, Fujisaki etal. (Fujisaki and Suzuki, 2007) in 2007 extended the concept of ring signature into the so called traceable ring signature by adding an issue related tag into the signature. In this case, anyone in the ring, pretending to be another person to sign the same message, would face the riskof revealing his/her identity immediately. This idea was adopted to prevent double-spending and now becomes the basis of CryptoNote (vanSaberhagen, 2013) with a slight modification.However, either CryptoNote or Ring-Coin suffers from the possibleattack based on the observation and analysis of the amounts sent ina given transaction (Noether, 2015). To hide amounts for any transaction, Maxwell (Maxwell, 2017) proposed the concept of the confidentialtransaction by using homomorphic commitment protocol.

Shortly afterward, Noether (Noether, 2015) offered a modification to the Moneroprotocol by coupling three techniques: Maxwell's confidential transaction, ring signature and multilayered linkable spontaneous, anonymousgroup signature (MLSAG). Noether's idea is now named as Ring Confidential Transactions for Monero (RingCT for short).In 2017, Sun et al. (Sun et al., 2017) proposed a non-trivial upgradedversion towards RingCT, named as RingCT 2.0. Besides the rigorous formalization of the syntax of RingCT and formal security models, RingCT2.0 also applies some well-known cryptographic primitives, includingPedersen commitment, the accumulator with one-way domain and sig-nature of knowledge, to obtain the significant storage and communication cost saving. More specifically, the signature size is reducedfromO(nm)to O(m),wherenandmare the numbers of groups andaccounts in one group, respectively. In other words, the transaction size in RingCT 2.0 is independent of the number of groups in the ring, andthis enables each block to process more transactions

4.2 One-time (ring) signatures

Lamport in 1979 (Lamport, 1979) proposed the concept of one-timesignature (OTS), where the signing key can be usedsecurely but onlyonce, and the signing key would be revealed if it is used twice or more.OTS is frequently used as a building block in constructions of encryptions and authenticated key agreements.By combining the ideas of OTS and ring signature, Saberhagen (vanSaberhagen, 2013) proposed a new signature scheme where the privatekey can be used only once for signing on behalf of a group. Supposethat Bob's public key is(A,B), and Alice wants to send a payment toBob. Then, Alice can pick a random number$r \in \mathbb{F}_q$and compute thetransaction public keyRand the destination keyPas follows:

$R=rG$and$P=Ḥs(rA)G+B$,

Where $Ḥs : \{0,1\}* \to \mathbb{F}_q$is a cryptographic hash function andGis thepublic base point of the elliptic curveE($\mathbb{F}_q$). Then, Bob can locate Alice'spayment via checking every past transaction on the blockchain with hisprivate key pairs(a,b) to see if$P=Ḥs(aR)G+B$holds. After locating Alice's payment, Bob can recover the corresponding one-time private key $x=Ḥs(aR)+b$(6)and spend this output at any time by signing a transaction with$x$.

4.3 Borromean (ring) signatures

Another interesting primitive related to ring signature andblockchain is the so-called Borromean (ring) signature (BRS), proposedby Maxwell and Poelstra in 2015 (Maxwell and Poelstra, 2015). Poelstra(Poelstra, 2017) claimed that BRS is now used in Elements (Element,2015), Liquid (Liquid) and Monero. Moreover, all of those projects arenow being transited from the BRS-based range proofs to Bulletproofs(Bünz et al., 2017).In an abstract view, a ring signature is nothing than a signature thatthe signer knows one of secret keys foragivengroup,say$x1 \vee x2 \vee \cdot \cdot \cdot \vee xn$,while a Borromean ring signature extends this idea to the scenariowhere the signer knows one of secrets foreach given group,say$(x1 \vee x2 \vee \cdot \cdot \cdot) \wedge (y1 \vee y2 \vee \cdot \cdot \cdot) \wedge \cdot \cdot \cdot \wedge (z1 \vee z2 \vee \cdot \cdot \cdot)$.Apparently, this idea gains the capability to express knowledge of anymonotone boolean function of the signing keys (Maxwell and Poelstra,2015).Although the primitive of attribute-based signature (ABS) (Majietal., 2011) can also realize theformula by considering signing keysx1,x2,...,y1,y2,...,z1,z2,···as attributes and modeling the signingcapability as a tree-like access structure corresponding ,thereexists an essential difference between ABS and BRS. In particular, ABSfocuses on who can generate a valid signature, while BRS focuses onhow to aggregate multiple ring signatures anonymously. That is, thevalidations of all involved ring signatures in a BRS scheme are intertwined. If one of the ring signatures involved in the joint Borromeansignature is invalid, then the entiresignature is invalid, and you cannottell which one is invalid (Poelstra, 2017). This is the very reason forthe name Borromean ring signature. In topological,Borromean ringsis astyle of interlocking rings such that each ring goes through each otherring (Poelstra, 2017;Cromwell et al., 1998).The

construction of BRS scheme in reference (Maxwell and Poel-stra, 2015) is based on an elegant combination of several efficient techniques, including Schnoor authentication(Schnorr, 1991), AOS ring sig-nature (Abe et al., 2002), and the newly developed "halfchameleon hash" and "multiple chameleon hash". Interested readers are suggestedto refer (Maxwell and Poelstra, 2015)formoredetails.

4.4 Multi-signatures The primitive of multi

Signatureallowsasinglesignaturetoworkas several ordinary signatures on the same message. One of the critical requirements of multi-signature is that the single signature has thesame size as one regular signature. This primitive was introduced by(Itakura and Nakamura, 1983) in 1983 and has been studied over thepast decades (Ohta and Okamoto, 1999;Okamoto, 1988;Boldyreva,2002;Micali et al., 2001).Very recently, ZILLIQA team (Zilliqa) proposed the next gener-ation high throughput blockchain platform by using an EC-Schnorr multi-signature protocol as one of its innovative ingredients. Morespecifically, the protocol in ZILLIQA consists of the followingsteps:

•The standard Schnorr signature scheme (Schnorr, 1991) is instantiated over the elliptic curve specified bysecp256k1(Certicom-Re-search, 2000).

•The above EC-Schnorr signature scheme for a single user is extendedto an EC-Schnorr multi-signature scheme for multiple users based onthe idea in reference (Micali et al., 2001)

.•The above EC-Schnorr multi-signature is tweaked for PBFT (practical Byzantine fault tolerance) settings, where the message isrequired to be properly signed by at least23n+1 nodes in the committee.

V. HASH-BASED POST-QUANTUM DIGITALSIGNATURES

5.1One-TimeSignatures

Hash-based signature schemes have been documented in the literature since 1979, thanks to the LamportOTS scheme .The logic behind Lamport's scheme is straightforward,the signer generates pairs of random values per bit required to be signed and these pairs form the private key. The public key is formed by the hashes of those values. To sign a message, the signer reads the message bitwise and presents one value from each secret pair depending on the bit value. The verifier can then validate that the hashes of all the secret values are equal tothecorrespondinghashvaluesinthepublickey.

Although Lamport OTS hash computations are considered fast, key and signature sizes are relatively large. For instance, if SHA256 is used as the underlying hash function, the public key consists of 512 hashed outputs of 256 bits each (one hash-pair per bit), while the signature consists of 256 secret values (256 bits each). If we aggregate the above, the key and signature consist of 24.5 kB. Similarly, if SHA512 is applied, about 98 kB are required.

Further enhancements to the original algorithm, reduce the key size significantly. At present, the WOTSalgorithmanditsvariantsareconsideredsomeofthe most efficient key and signature compression methods, while Bleichenbacher and Maurer's graph-based scheme attempts to achieve the best possible efficiency in terms of signature size and number of hash function evaluations per bit of the message.

As a note, one of the main differences between OTS approaches lies in the security assumptions of requiring (or not) collision resistant hash functions and the use ofextra bitmasks. Currently, WOTS-T, proven to be secure in the QROM model, is considered one the the most promising candidates from the WOTSfamily, because only one extra seed value is required along with the public key to compute the required bitmasks, while its security is not affected by the birthday paradox and it also introduces keying of all hash functioncallstopreventmulti-targetsecondpre-imageattacks. The latter results in shorter public keys and hash-outputsizes.

5.2Few- and Many-TimeSignatures

Although there exist multiple methods to turn a one-time into a multi-time signature scheme ,a popular approach is to use Merkle authentication

trees by fixingbeforehand the total number of signatures which will ever be produced. Using Merkle trees, the total number of signatures which can be issued is defined at key generation. The main benefit is its short signature output and fast verification, while the drawbacks are the relatively expensive key generation time and the fact that they are stateful. Figure 1 depicts a 4-time (atmaximum)Merkletreesignaturescheme.
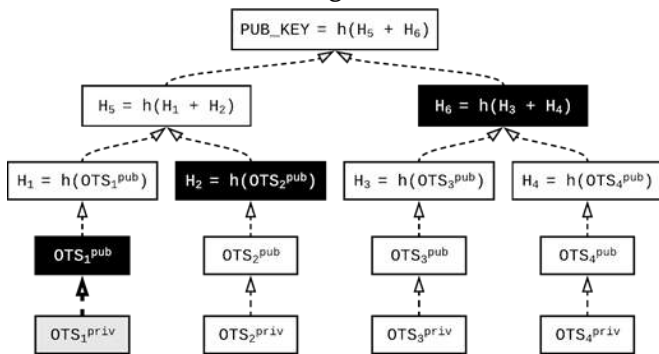
Fig. 1:Few-time Merkle tree signature scheme able to sign four messages in total. Dark nodes represent the authentication path required if we sign with OTS 1.

Moving to stateless few-time signatures requires extra complexity and larger signature outputs. HORS (and its extension HORST) is currently the one used in the majority of many-time stateless signature schemes, such as SPHINCS .

Many-time hash-based schemes can be constructed by combining the above {one and few} time constructions and they are grouped into two categories, stateful (e.g., XMSS, LMS) and stateless (e.g., SPHINCS, SPHINCS+, Gravity, Simpira, Haraka). Stateful schemes typically produce shorter signatures, but they need a mechanism to keep state (what paths/keys have already been used).

On the other hand, stateless schemes start with a moderately large Merkle tree or tree-layers at the top, but instead of using OTS signatures at the bottom, they use a few-time signature method. The latter allows them to pick indices randomly and thus no path-state tracking is required. The downsideto stateless schemes is their signature size; for instance, in SPHINCS-256eachsignatureis41kBlong.

It is highlighted that the distinction between few- and many- time hash-based signature schemes is not always clear. In the literature, few-time usually refers to stateless schemes, such as BiBa, HORS and HORST, for which practical parameters allow multiple signing operations, but not enough signatures to be considered in many real-world applications. On the other hand, many-time schemes can be configured to allow highly interactive environments to reuse the same key- pair for many years. The authors of Gravity SPHINCS claim that 1 trillion (240) signatures is a reasonable upper bound, whilst SPHINCS-256 allows for a maximum of 1 quadrillion (250) signatures. In practice, one can parameterize amany-timeschemetosupportjustafeworseveralsignatures.

5.3SpeedandSecurityofHashFunctions

The underlying hash algorithm is of obvious importance to the overall security of the proposed scheme. Several factors influence the choice of algorithm, including speed, security level and availability; e.g., what hardware features can be leveraged to improve the runtime performance, and what implementations are available in existing, well-reviewed cryptography libraries.

The first thing to establish, however, is whether the al- gorithm is resilient to PQ attacks. The SHA-2 and SHA-3 algorithms support multiple digest sizes, namely 224, 256, 384 and 512 bits [36], [37]. We observe that by leveraging the improved search speed provided by Grover's algorithm, collision resistance can be reduced from a half to a third of the chosendigestsize.Consequently,inthepresenceoflarge-scale quantum computers, 384-bit versions of SHA-2 and SHA-3 would provide 128 bits of security against collisions, whereas the256-bitversionswouldonlyoffer85bits.

Further, we observe that quantum pre-image attacks on 256- bit versions of SHA-2 and SHA-3 can be realised by 2153.8 and 2146.5 surface code cycles, respectively[38].

Asaresultofthesetwoobservations,SHA256isconsidered unsuitable for use in schemes basing their security on hash collision resistance, but it is still secure otherwise. It should also be mentioned that

PQ algorithms have fundamentally worse price-performance ratio than the classical vanOorschot-Wiener hash-collision circuits, even under optimistic assumptionsregardingthespeedofquantumcomputers[39].

From performance measurements presented in eBACS [40], we have evaluated the relative performance of SHA-2, SHA-3 and BLAKE2 on general-purpose CPUs. We have deliberately chosen an Intel, an AMD and an ARM processor to cover typical desktop and mobile units.

As can be seen from Table 1, the number of cycles per byte decreases with the size of the input. This is expected due to the small input sizes in this comparison and the block-wise operation mode of the hash functions. The rate of decrease naturally flattens out as the input grows beyond the blocksize.

It should also be noted that the different versions of SHA-3 generally performs worse than their SHA-2 counterparts. One of the reasons for this is the fact that SHA-1 and SHA-2 have better hardware support from modern processors, e.g., through instruction set extensions like the Intel® SHA Extensions.

Note that, despite not offering protection against length extension attacks, SHA-2 offers similar bit-level security to SHA-3. Typically, hash-based PQ schemes, including BPQS(Blockchain Post Quantum Signature), are not prone to such attacks and therefore, we consider SHA- 2 to be a better alternative due to the performance benefits it offers.

If performance is of importance, one can also consider employing the less supported BLAKE2b [41] algorithm. We highlight, however, the lack of wide-spread library support compared to the aforementioned algorithms.

Table 1: Performance Metrics for SHA-2, SHA-3 and Blake

Input Size	Measurements of Hash Functions[a] Cycles / Byte (relative to SHA2-256 on 8 byte input)								
	SHA-2			SHA-3			BLAKE2[b]		
	Intel	AMD	ARM	Intel	AMD	ARM[c]	Intel	AMD	ARM
256-bit utput									
8	1.00	0.19	2.99	3.48	2.89	6.78	0.47	0.38	2.30
64	0.24	0.04	0.54	0.46	0.38	0.85	0.05	0.04	0.28
576	0.13	0.02	0.20	0.25	0.21	0.40	0.05	0.04	0.15
512-bit utput									
8	1.49	1.12	5.72	3.58	3.00	6.79	0.53	0.46	3.23
64	0.19	0.14	0.71	0.48	0.40	0.85	0.07	0.05	0.41
576	0.09	0.05	0.30	0.43	0.36	0.71	0.03	0.03	0.14

[a]Based on numbers reported by ECRYPT II in eBACS [40].

Intel - amd64, genji122,supercop-20171020

AMD - amd64, genji262,supercop-20171020

ARM - armeabi, odroid,supercop-20160806

[b]BLAKE2s with 32-bit words, 10 rounds, and 256-bit output; BLAKE2b with 64-bit words, 12 rounds, and 512-bit output.

[c]No data for SHA-3; numbers are for keccakc512/1024 with 256- and 512-bit output sizes, respectively. These are the Keccak team's final submissions for SHA-3-256 and SHA-3-512.

VI. BLOCKCHAINED POST-QUANTUM SIGNATURES TAILORED TO ONE-TIME KEYS

Most if not all few-time hash-based signature schemesmake use of Merkle trees. The maximum number of messages a basic Merkle tree signature scheme can sign is 2h, where h is the height of the tree. Also, all leaves (keys) should be computed during key generation in order to form the root. Due to the above, to construct a tree of height h = 40, key generation would be considered impractical, because we need to compute 240OTS keys and each OTS key internally requires many hash invocations (i.e., 512 hash invocations with LamportOTS or 67 for WOTS (w = 16) when using SHA256). The trick to keeping key generation time practical, while allowing for a large number of signatures is to use a multi-leveltree.

BPQS is a simplified single-chain variant of the XMSS family protocols which are literally an extension of the basic Merkle tree signature scheme (see Figure 1). BPQS can theoretically sign many times, but its design focuses on short and fast one-time signatures with the extra option to re-sign if and when needed. The above requirement is what a typical blockchain or DLT requires, as the use of one-time keys is recommended to preserve anonymity. However, a lot of things can go wrong, e.g., a transaction might not go through or there might be a fork in the chain, in which case one

should be able to sign more than one time without compromising security or freezing assets.

An additional, surprising benefit of BPQS is that it is alsoan ideal candidate for the opposite requirement; signing multiple times with the same key. This interesting property is due to the underlying graph-structure of blockchain and DLT systems that effectively allow many-time signatures at a minimal cost comparedtootherhash-basedPQsolutions.Thisworksbyreferencing the block (or transaction) in which the same BPQS key has been used in the past. In short, only a small part of the new signature is required to be submitted and the rest of the path will be delegated to the previous transaction this key was used to sign. The latter enables us to complete the full path to the advertised root BPQS key. Actually, because previous transactions are verified on the ledger already, verifiers do not even need to validate the rest of the path, as it was inherently verified in the past. This characteristic makes BPQS very useful for notary-based DLTs, such as Cordaand Fabric, as the notary nodes normally sign transactions with the same knownkey.

6.1BPQSScheme

BPQS requires an underlying OTS scheme. Although any OTS solution could in theory be applied, our scheme shares logic with the XMSS protocol family, hence the selection of the WOTS variant, use of L-Trees and generation of bitmasks (blinding masks) define the security assumptions and proofs,similarlytoXMSS,itsmulti-levelversionXMSSMTand XMSS-T [27]. Also, according to, collision resistance is actually cheaper using quantum algorithms, and thus similarly to the Gravity SPHINCS scheme, bitmasks and L-Trees might beomitted.

One could state that BPQS is a subset of XMSS tailored to fast first-time signatures. The main difference is that XMSS overcomes the limitation to one message per key by usinghash trees which reduce the authenticity of many OTS verification keys to one public XMSS root key. In contrast, BPQS utilises a chain of small 2-leaf Merkle trees. Geometrically, XMSS grows in both width and height (see Figure 1), while BPQS grows on chain height only (see Figure 2). All in all,we stress that BPQS is a generic blockchained construction,where blocks are "tiny" Merkle trees, meaning that it can be parameterised according to the requirements of the application. In case blinding masks are applied, their deterministic generation should follow the same logic with the corresponding XMSS familyscheme.

There are 2 basic building blocks of BPQS:

·   BPQS-FEW, which strictly supports few-time signatures andisdepictedinFigure2(left),

·   BPQS-EXT, which theoretically can be extended to sup-   portmany-timesignatures,seeFigure2(right).

In BPQS-FEW, all keys are precomputed during key gen- eration, the penalty for each extra signature is just 1 extrahash output, but it cannot be extended to practically support "unlimited"signatures.

On the other hand, BPQS-EXT initially requires only two OTS keys and in contrast to BPQS-FEW, the left leaf in each 2-leaf Merkle tree is an OTS fallback key that can be used to sign the next signature block when required. Unfortunately, the extensibility property comes with the cost of requiring one extra WOTS key per newsignature.

The full BPQS scheme combines both BPQS-FEW and BPQS-EXT in a way where the last leaf in the chain of BPQS- FEW is a BPQS-EXT fallback key. This trick allows us toconvert the few-time variant to a many-time one. Actually, BPQS-EXT can be considered a special case of BPQS, in which there is no initial BPQS-FEW chain.
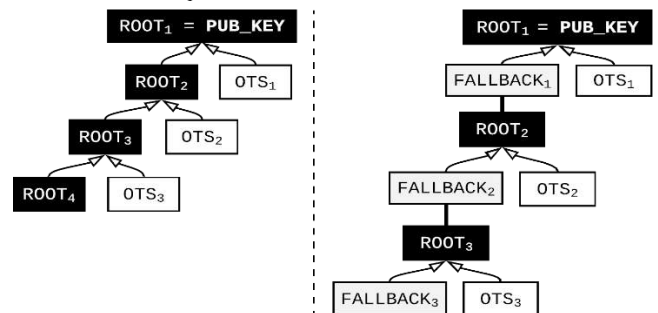
Fig. 2: BPQS-FEW (left), a few-time signature scheme. BPQS-EXT (right), a linearly extensible many-time signature scheme.
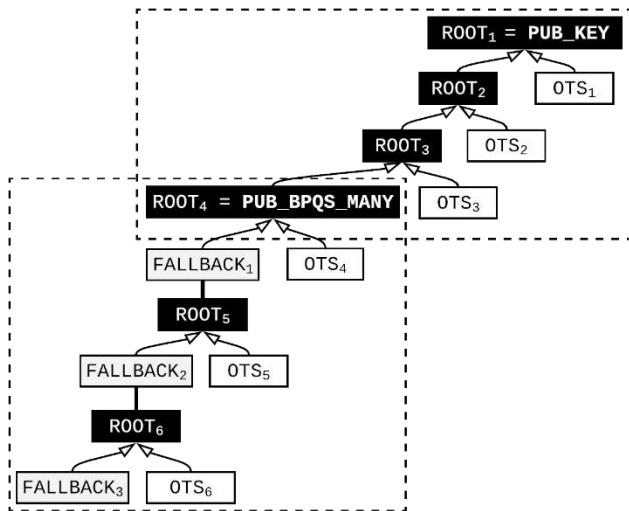
Fig. 3: Full BPQS protocol, with a height-3 BPQS-FEW top-level and a BPQS-EXT fallback key to allow for extensibility.

Parameters for BPQS include:

· the WOTS variant used (e.g., WOTS-T[27]),

· theWinternitz parameter (e.g., w = 16), which defines the base at which the initial hash is interpreted. Similarly to XMSS [5], w defines the actual size of each WOTS chain, which in turn affects signature size. Note that there is no consistency on the interpretation of the Winternitzparameter in the literature. For instance, in LMS [45] it is defined as 2^w and thus $w_{BPQS} = 16 = 2^4$ would be equivalent to $w_{LMS} = 4$,

·theunderlyinghashfunction(i.e.,SHA384),

·thenumberofprecomputedOTSkeys,meaningtheinitial height (e.g., h =4).

6.2BPQSMixed

The extensibility property of BPQS enables various custom constructions. BPQS can be used as a building block toconvert any hash-based signature scheme into a {first or few} time optimised one. For instance, in Figure 4, BPQS-FEW is used for the first (shorter) signatures and then it fallbacks to another PQ scheme. Although in the depicted approach the key-pair of the fallback (other) PQ scheme should be a-priori known and precomputed, one could use the BPQS-EXT in a similar fashion, so that this is not necessarily a requirement and the "other" PQ key will be generated only after the few-time signatures

are exhausted. Moreover, if the "other" PQ scheme is stateless, such as SPHINCS, the final protocol is literally a "startstatefulthengostateless"scheme.

It should be emphasized that the "other" PQ scheme might be another BPQS scheme, so one could eventually create a chain of different BPQS schemes. The latter would result in shorter signatures versus just extending it with BPQS-EXT each time.

With regards to the "Other PQ Key Params" shown in Figure 4, it is important that some schemes are required to publish bitmasks (or a seed in XMSS-T [27]) as part of the initial advertised public key. Otherwise, it would allow an adversary to select the seed/bitmask in a forgery. However, if BPQS uses a hash function with a bigger output (e.g., SHA384 or SHA512) this might not be necessary, because the provided security-level against potential quantum collision attackswouldstillbeenoughtopreventsuchattacks.
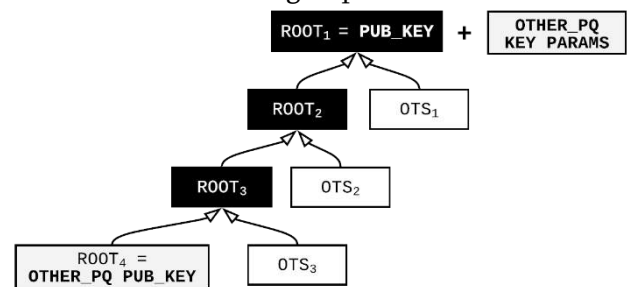
Fig. 4: A versatile BPQS protocol (BPQS-VERS1), with a BPQS- FEW top-level of height 3, in which the last root is the public key ofanotherPQscheme,suchasXMSSMT[44]orSPHINCS+[32].

6.3Combined PQSchemes

As already mentioned, BPQS can fallback to another PQ scheme whenever required. By applying a similar logic, Figure5showsvariouscustommodelsforcombiningmultiplePQ schemes into one. The approach is very simple, but allows for very useful constructions, such as a "Stateful and Stateless" scheme in Figures 5 A and B, or a "Stateful with Stateless Fallback" scheme in Figure 5 C. The latter provides a solution to clustered environments in which multiple nodes require consensus over signature states, but a fallback

mechanism is a prerequisite for the system to stay functional if consensus fails for anyreason.
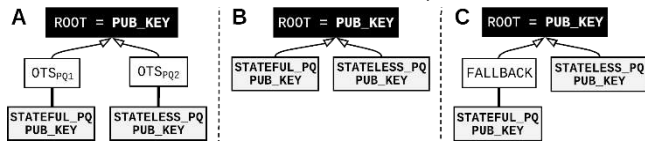
Fig. 5: Various recommended designs using a parallel BPQS logic to combine multiple schemes into one concrete PQ solution. Note that if the underlying schemes require extra parameters, such as bitmasks, these should be published along with the root public key, similarly to Figure4.

The three depicted approaches offer different flexibility when it comes to:

1. Choosing a balance between key generation time and size ofsignature,

2. Deciding whether to allow for picking of the underlying algorithms at a latertime. Forinstance,optionBrequiresbothPQkeystobegenerated to form the to-be-advertised combined public key, whilst option A is practically a BPQS-EXT that will be used to sign the "upcoming" PQ schemes. Along the same lines, option C is a combination of A and B, but the left PQ scheme is not required to be a-priori selected and computed. Note that one could even combine two different stateful or stateless schemes together, e.g., if needed for compatibility purposes, such as when using the same key in two different blockchains, one supporting the original SPHINCS-256 and the other supporting a variation of it (or its standardised version when this becomesavailable).

VII. CONCLUSION

In this work, we introduced BPQS and its extensions to support {one and few}-time optimised post-quantum signa- tures. We have also presented the security challenges that blockchains and DLTs will soon face and why pure OTS schemes are not recommended as a quantum-resistant replace- ment. As shown, BPQS compares favourably even against conventional non-quantum schemes such as RSA,

ECDSA and EdDSA, while it provides more reliable quantum-security estimates because of its rooting in a secure cryptographic hash function.

Among others, the main features of the BPQS protocol are:

· shorter signatures, and faster key generation, signing and verificationtimesthantheXMSS[5]andSPHINCS

[23] family PQ protocols when signing for one or few times, which is usually preferred in blockchain systems to preserveanonymity,

· it is computationally comparable to non-quantum schemes. One can take advantage of the easy-to-apply multiple hash-chain WOTS parallelisation and caching to providealmostinstantsigningandfasterverification,

· its extensibility property allows for many-timesignatures, while it can also easily be customised, so it can fallback toanothermany-timeschemeifandwhenrequired,

· when used in blockchain and DLT applications, it can take advantage of the underlying chain/graph structure by referencing a previous transaction, in which the same key is reused. This could effectively mean that each new BPQS signature simply requires the effort of an OTS scheme, because the rest of the signature path to the root isintheledgeralreadyandcanbeomitted,

· it could be used as a building block to implement novel PQ schemes such as a simultaneously "Stateful and Stateless" scheme, which might benefit clustered envi- ronments, where nodes can fallback to stateless schemes when consensus is lost. Additionally, such schemes can be used for forward and backward compatibility purposes or when requiring to reuse a key between two indepen- dent and incompatibleblockchains.

The main drawback of the original BPQS protocol is that the size of its signature output increases linearly with the number of signatures. However, one can mitigate this by using a combined PQ approach or by utilising existing graph struc- tures in blockchain applications. All in all, the customisation, caching and extensibility properties of BPQS make it an ideal

candidate for blockchains and it could serve as a bridging protocolbetweenstateless,statefulandotherPQschemes.

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Business Practices using Machine Learning

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ABSTRACT

Busy life schedule leading to the growth of E-commerce companies. Many Challenge in development of business through web pages, apps and retail stores. Proper utilization of invested funds by analyzing costumer preferences and purchases from the previous marketing data. Business practices are very arduous to transmute especially in astronomically immense and mature companies. Introducing incipient ways of working is astronomically arduous, but making people work differently is virtually infeasible. There is immensely colossal cultural inertia in these companies and business industry in general. Utilization of Machine Learning is one of those transmutations that will make people work differently and will make business environments different in future.

Keywords : Machine Learning algorithms; Supervised Learning; Unsupervised Learning; Reinforcement Learning.

I. INTRODUCTION

By using the seaborn library the statistical graphs will be drawn between data sets(yearly amount spent ,time spent on app, time on website ,retail shop length)Finding the cross co-relating factor that is linear to the x and y factors. Using the cross co-relating factor we test and train the model with our own set of values and find the average co-ordinates between them .Each co-ordinates specify the values such has time on app, time on website and membership length. By which we decide to develop the business.

Multinational company that has both E-commerce and retail store which decides whether to focus their efforts on their mobile app experience or their website or to develop their retail stores.

The basic consumer data such has name, email, age, length of membership, yearly amount spent, time spent on app or website and internet used.

All this data will be collected from company has a sample data Processing the data involves the usage of libraries such has pandas, NumPy and seaborn. Pandas is a open source library providing high-performance, easy-to-use data structures and data analysis tools for programming languages. NumPy is a library for the adding support of large multi-dimensional arrays and matrices. along with mathematical functions to operate on arrays .Seaborn tool is a data visualization library works on matplot lib. It provides joint plot options to compare the linearity and co-relation factor.

A. Role of big data in business development

The true role played by big data in business development is important and far-reaching, especially when it comes to long term client satisfaction. In the best of all possible worlds, companies will use the data they collect to improve their products and the customer experience .As we invite more connected things into our lives — from smart thermostats to Apple watches and fitness trackers. These are just the top four impacts I soothsay immensely colossal data will have on businesses of all types in the near future.

Even the smallest businesses generate data these days. If the company has a website or a social media related or accepts credit cards etc., even a one-person shop has data it can collect on its customers, its user experience, web traffic, and more. This means companies of all sizes need a strategy for big data and plan how to collect, use, and protect it.

Business development is a process of developing a long term business model. It governs the use of analytics and focuses on every stage of the process, from developing a strategy to executing it.

The goal is to create a successful business model for all stakeholders. Of course, shareholders need to know that the model will provide great compensation for them. However, business development must also focus on the needs of customers, employees and others affected by the business.

Big data is a field of engineering that deals with large datasets which follows the ETL method of capturing the data from one data environment, extracts it, transforms and loads it into another data environment in an effective manner. Big data is an essential technology when efficiency and accuracy is of highest concern. It integrates and analyses massive amounts of data to reduce the cost of failure and improve the system. It is also a database for correlating the collected data and the user can access a part of the stored information.

B. Machine Learning algorithm

There are many Machine Learning Algorithms helps for analysis. The method of how and when you should be using them. By learning about the List of Machine Learning Algorithm you learn furthermore about AI and designing Machine Learning System.

Machine Learning(ML) can be explained as automating and improving the learning process of computers based on their experiences without being actually programmed i.e. without any human assistance. The process starts with feeding good quality data and then training our machines(computers) by building machine learning models using the data and different algorithms. The cull of algorithms depends on what type of data do we have and what kind of task we are endeavoring to automate.

These are the most paramount Algorithms in Machine Learning. If you are vigilant of these Algorithms then you can utilize them well to apply in virtually any Data Quandary. Data analyst and the Machine Learning developers utilize these Algorithms for engendering sundry Functional Machine Learning Projects. Then comes the 3 types of Machine Learning Technique or Category which are utilized in these Machine Learning Algorithms. The three categories of these Machine Learning algorithms are:

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning

1).The supervised Learning method is used by maximum Machine Learning Users. It is called Supervised Learning because the way an Algorithm's Learning Process is done, it is a training data set. And while using Training dataset, the process can be thought of as a teacher supervised the Learning Process. The correct answer is known and stored in the system already. The algorithm Predict Data that is in Training Process and gets the results[1][2][3].

Supervised learning is the learning of the model where with input variable (say, x) and an output variable (say, Y) and an algorithm to map the input to the output

That is, Y = f(X)

Why supervised learning?

It is called supervised learning because in this process (from the training dataset) can be thought of as a mentor who is supervising the entire learning process. Thus, the "learning algorithm" iteratively makes predictions on the training data and is corrected by the "mentor", and the learning stops when the algorithm achieves an acceptable level of performance(or the desired accuracy).

Example of supervised learning:

Suppose there is a basket which is filled with some fresh fruits, the task is to arrange the same type of fruits at one place.

Also, suppose that the vegetables are onion, tomato, chilli, ginger. Suppose we already knows from their previous work (or experience) that, the shape of each and every vegetable present in the box so, it is easy for people to arrange the same type of vegetable in one box.

Here, the previous work is called as training data in Data Mining terminology. So, it learns the things from the training data. This is because it has a response variable which says y that if some vegetable has so and so features then it is onion, and similarly for each and every vegetable. This type of information is deciphered from the data that is used to train the model.

There are two types of supervised learning problems. These Supervised quandaries can be further grouped into regression and relegation quandaries.

· Classification Quandaries: Relegation quandary can be defined as the quandary that brings output variable which falls just in particular categories, such as the "red" or "blue" or it could be "disease" and "no disease".

· Regression: A regression quandary is when the output variable is a real value, such as "dollars" or it could be "weight".

Unsupervised Learning: Unsupervised learning is where only the input data (say, X) is present and no corresponding output variable is there.

Why Unsupervised Learning?

The main aim of Unsupervised learning is to model the distribution in the data in order to learn more about the data.It is called so, because there is no correct answer and there is no such mentor(unlike supervised learning). Algorithms are left to their own devises to discover and present the interesting structure in the data ,it works with unlabeled data set.

Unsupervised learning is that algorithm where you only have to insert/put the input data (X) and no corresponding output variables are to be put.

The major goal for the unsupervised learning is to avail model the underlying structure or maybe in the distribution of the data in order to avail the learners learn more about the data.

Unsupervised learning quandaries can even be grouped ahead into clustering and sodality quandaries[4][5][6].

1. Clustering: A clustering is that problem which indicates what you want to discover and this helps in the inherent groupings of the data, such as grouping the customers based on their purchasing behavior.

2. Association: An association rule is termed to be the learning problem. This is where you would be discovering the exact rules that will describe the immensely colossal portions of your data. Example: People who buy X are withal the one who inclines to buy Y.

C. Linear Regression

Before knowing what is linear regression, let us get ourselves accustomed to regression. Regression is a method of modeling a target value predicated on independent presages. This method is mostly utilized for forecasting and ascertaining cause and effect relationship between variables. Regression techniques mostly differ predicated on the number of independent variables and the type of relationship between the independent and dependent variables.

Simple linear regression is a type of regression analysis where the number of independent variables is one and there is a linear relationship between the independent(x) and dependent(y) variable. The red line in the above graph is referred to as the best fit straight line. Predicated on the given data points, we endeavor to plot a line that models the points the best. The line can be modeled predicated on the linear equation .As the name indicates this already, linear regression is well known to be an approach for modeling the relationship that lies in between a dependent variable 'y' and another or more independent variables that are denoted as 'x' and expressed in a linear form. The word Linear indicates that the dependent variable is directly proportional to the independent variables. There are other things that are to be kept in mind. It has to be constant as if x is increased/decreased then Y also changes linearly. Mathematically the relationship is based and expressed in the simplest form as: This is $y = Ax + B$. Here A and B are considered to be the constant factors. The goal hidden behind the Supervised learning using linear regression is to find the exact value of the Constants 'A' and 'B' with the help of the data sets. Then these values, i.e. the value of the Constants will be helpful in predicting the values of 'y' in the future for any values of 'x'. If there is a single and independent variable it is called as simple linear regression and if there is more than one independent variable, then this process is called multiple linear regression.

The Mundane Least Squares Regression or call it mundane least squares (OLS). The linear least squares. When we consider the statistics, this is a method where we estimate the unknown parameters. This is kenned as the linear regression model, it comes with the goal which minimizes the differences of the observed replications in some arbitrary dataset.

Withal, minimizes the replications that are very well soothsaid by the linear approximation of the data (visually this can be optically discerned as the sum, which is of the vertical distances falling in between each data point in the set and the corresponding points on the regression line – it is observed that the more minute the differences are, the better would be the model that fits the data).The resulting estimator can be expressed in the form of a simple formula, especially when this falls in the case of a single regressor and is on the right-hand side. The OLS estimators are kenned to be authentically consistent whereas the regresses are exogenous and there lies no impeccable multicollinearity, and this remains optimal in the class of the linear equitable estimators. While there are errors, these are homoscedastic and serially uncorrelated. Under these conditions, there is a method of OLS. It provides with the minimum-variance, there is a mean-unbiased estimation, here the errors would have finite variances. Under these additional assumptions, there are errors that could be normally distributed. The OLS algorithm is the maximum likelihood estimator[7][8].

II. LINEAR REGRESSION USED FOR BUSINESS DEVELOPMENT

By using the seaborn library the statistical graphs will be drawn between datasets(yearly amount spent , time spent on app, time on website , retail shop membership length) .Finding the cross co-relating factor that is linear to the x and y factors. Using the cross co-relating factor we test and train the model with our own set of values and find the average co-ordinates between them. Each co-ordinates specify the values such as time on app, time on website and

membership length. By which we decide to develop the business. After that we get large points in x and y axis so, to get the exact average of the customer outcome we use linear regression Compared to any other model linear regression gives more accurate results for the customer detail outcome[9][10].

Sample code is given below

```
customers = pd.read.csv("Ecommerce
Customers")
customers.head()
customers.describe()
sns.jointplot(x='Time on
Website',y='Yearly Amount
Spent',data=customers)
sns.jointplot(x='Time on
App',y='Yearly Amount
Spent',data=customers)
sns.jointplot(x='Time on
App',y='Length of
Membership',kind='hex',dat
a=customers)
sns.pairplot(customers)
sns.lmplot(x='Length of
Membership',y='Yearly Amount
Spent',data=customers)
X_train, X_test, y_train, y_test =
train_test_split(X, y, test_size=0.3,
random_state=101)
predictions = lm.predict( X_test)
print('MAE:',
metrics.mean_absolute_error(y_test,
predictions))
print('MSE:',
metrics.mean_squared_error(y_test,
predictions))
print('RMSE:',
np.sqrt(metrics.mean_squared_error(y_test,
predictions)))
sns.distplot((y_test-predictions),bins=50);
coeffecients =
pd.DataFrame(lm.coef_,X.columns)
coeffecients.columns =
['Coeffecient']
coeffecients
```

III. RESULTS
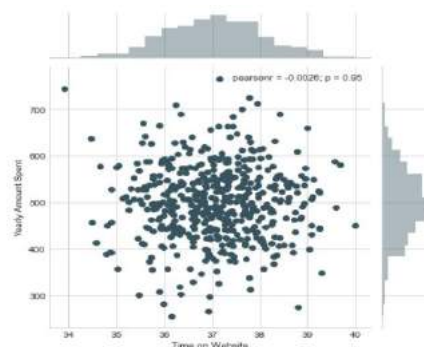
Do the same but with the Time on App column instead.

Figure 1. Time spent on Website

In figure.1 Use seaborn to create a joint plot to compare the Time on Website and Yearly Amount spent columns. Here we see the total duration spent by the customer on website and the amount spent per annum on the website.
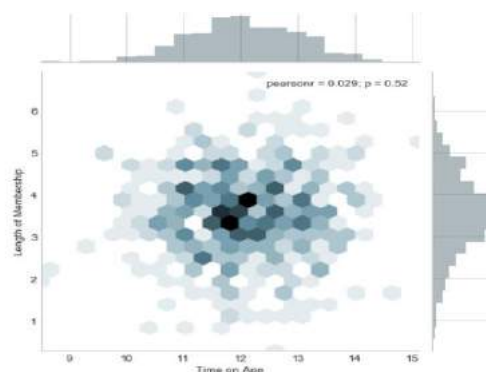
Figure 2. Time spent on App

In figure.2 we have a graph between Time on App and Length of membership. Here we see the total of customers spending time on app and their membership of how long they've been part of the company as a customer
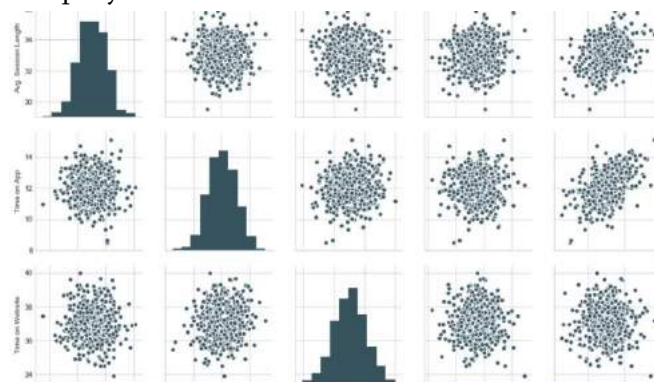
Figure 3. Relationships of the entire data set

In Figure.3 we come across the relationships of the entire data set. Here we are co-relating all the columns of the customer details to each other in the

graphs to find out the accurate co-relating out-put graph.
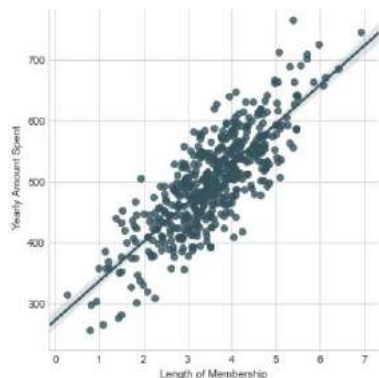
Figure 4. Yearly Amount Spent vs. Length of Membership

In the above Figure.4 the graph is between Yearly Amount Spent vs. Length of Membership. We get this graph in the final output because it's the most accurate graph out of all the co-relating graphs and we get the results based on this graph.
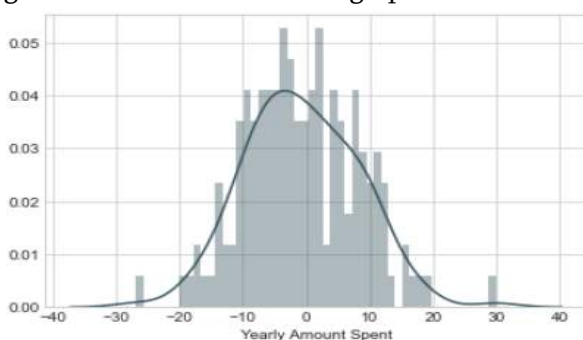
Figure 5. Time spent on App and website

	Coeffecient
Avg. Session Length	25.981550
Time on App	38.590159
Time on Website	0.190405
Length of Membership	61.279097

Figure 6. Results of the time on App and the time spent on the website

This is the final result. These results are based on final output graph and by this we decide on what can we invest in and according to the above results the time on App spent is greater than the Time spent on the website, by this accuracy we conclude that investment on App is better than investment on website.

IV. CONCLUSION

Multinational company that has both E-commerce and retail store which decides whether to focus their efforts on their mobile app experience or their website or to develop their retail stores .And to find the best way to advertise their products in most efficient way through these app and websites. Investment funding in E-commerce (app/web page) or retail store can be determined and is the best way of advertisement.It Increase the research efficiency in investment department. This project limits the loss of the investment. And it is helpful to detect the best way of advertising of the product. And have satisfied clients.

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Multi-Objective Optimization Approach to Generate String Test Data

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ABSTRACT

String test cases are required by applications to recognize deformities and security issues. Nonetheless, its viability isn't tasteful. In this paper, discovery string test case generation techniques are investigated. Two objective functions are acquainted to produce compelling test cases. The optimization of the test cases is the primary objective, where it very well may be estimated through string distance functions. The second objective is controlling the string length distribution into a Benford distribution which suggests shorter strings have, all in all, a higher shot of discontent location. At the point when the two objectives are connected by means of a multi-objective advancement algorithm, predominant string test sets are delivered.

Keywords : Random Testing (RT), Benford distribution, String Test Cases

I. INTRODUCTION

In this paper, the objective is to produce a compelling set of test cases where each test case is a string. As clarified before, in light of exact investigations [1]– [5], blame areas regularly form nonstop locales in the info space. In light of this presumption, a various set of test cases has a more prominent possibility of distinguishing a blame. Thus, it is trusted that an assorted set of test cases is bound to deliver increasingly viable test cases. To accomplish this in the string space, we have characterized a wellness work that estimates the assorted variety of a test set. This enables an advancement procedure to be utilized to produce test cases dependent on the wellness work. To build a wellness capacity to gauge the decent variety, we use distance functions between strings. There are a few string distance functions accessible and subsequently, in this paper, the performance when utilized in test generation is considered. Diverse string distance capacity's performance is thought about as far as the viability of the produced test cases and their runtime. Since runtime performance is important in useful applications, further part expands the paper by applying a hash based distance work into the test generation strategies to improve the runtime productivity.

The distribution of the length of the created strings assumes an important job in disappointment recognition. The paper contends that littler strings have a higher possibility of distinguishing a disappointment. Since the primary wellness work is unfit to control the length distribution of the strings, second wellness work which demonstrates the nearness of the distribution of the lengths of the strings in a test set to the objective distribution is considered. A multi-objective improvement system is utilized to apply both wellness functions at the same time.

II. ADAPTIVE RANDOM STRING TEST CASE GENERATION

As examined in the past paper, to improve the poor adequacy of RT, ART strategies are presented. Chen et al. [6] first presented Fixed Size Candidate Set (FSCS) and afterward an assortment of other ART techniques[7] have been created by different scientists. The greater part of the ART techniques are intended for numerical test cases and they can't be utilized to produce string test cases. Among the ART techniques, the FSCS and ART for Object Oriented software (ARTOO) [8] strategies are prepared to do more mind boggling test case structures than fixed size vector of numbers and they can be connected to string test cases. Further, Mayer et al. [9] presumed that FSCS was a standout amongst the best ART techniques through an experimental investigation. Subsequently, adjusted FSCS and ARTOO to produce string test cases in this paper; these are checked on in the accompanying areas.

A. Fixed Size Candidate Set (FSCS)

FSCS technique [2] significantly reduces the computation time. In this paper, a string distance work is utilized in FSCS. FSCS has been at first presented for numerical test cases. Be that as it may, it tends to be connected to other test case structures like strings. The main prerequisite is that a distance work is characterized between the test cases.

To create test cases, FSCS utilizes a distance based method. The main string test case is created randomly, like RT. At that point, to create other test cases, a fixed size candidate set is utilized to deliver a test case. Therefore, K random strings are created as candidates (K=10 is utilized in the investigations dependent on the proposal of Chen et al. [7]). A string is chosen where it has the biggest distance from recently executed string test cases.

B. ART for Object Oriented Software (ARTOO)

ARTOO [9] is an ART strategy intended for object oriented software where it utilizes a distance work between objects to produce the test cases. The creators center around the particular issue of testing functions of an object-oriented program where test cases are input objects to the functions. ARTOO works like FSCS , it chooses a test case among the pool of candidates. The quantity of candidates for ARTOO is picked as 10 to match with the FSCS. The distinction among FSCS and ARTOO is the choice guideline among the candidates. The mean distance of every candidate to the recently chosen test cases is determined. At that point, a candidate with the biggest mean distance is picked as the champ (next test case).

III. EVOLUTIONARY STRING TEST CASE GENERATION

To produce string test cases, evolutionary algorithms can be utilized. Among the evolutionary algorithms, Genetic Algorithms (GA) [13] are the most ordinarily utilized pursuit algorithm in software building [14],GAs additionally fit great with our application which requires string controls. Two methodologies are utilized to create test sets dependent on GAs. In the first place, we use a GA with a solitary objective, where a decent variety based wellness work is utilized. At that point, a second wellness work is characterized to control the length distribution of the strings. Thus, in the second methodology, we utilize a Multi-Objective GA (MOGA) to advance both wellness functions at the same time.

A. Genetic Algorithm (GA)

In the accompanying, we first quickly clarify GA's essential phrasing and after that, fitting wellness functions and GA's parameters are examined. Different chromosomes form a populace where a chromosome is a candidate arrangement. At every generation, a few chromosomes are chosen (by the choice instrument) and posterity are produced by means of a hybrid administrator. At long last, the transformation administrator is used to roll out random little improvements to the created posterity

bringing about a lower likelihood of getting to be caught in a nearby ideal point.

IV. METHODOLOGY

To produce the test cases the accompanying steps are performed by NSGA-II.

Step 1: The underlying populace with size N is produced randomly.

Step 2: The populace is sorted.

Step 3: A posterity populace with size N is made utilizing determination components, hybrid, and change.

Step 4: A joined populace of posterity and guardians is created with size 2N.

Step 5: The new populace is sorted and the main N chromosomes are chosen to form the people to come.

Step 6: A verify whether the halting foundation have been met is performed. On the off chance that the rule isn't met, at that point we come back to step 3.

V. STRING DISTANCE FUNCTIONS

A distance work between two strings is required in ART and evolutionary test case generation strategies. A few string distance functions are presented in the writing [9], [11], [12]. In spite of the fact that we can't afford to investigate every one of them, a great portion of them, particularly those that typically perform well in software testing examines, are shrouded in this paper. As needs be, we performed the tests with six string distance functions. Four of which are Levenshtein , Hamming, Cosine, Manhattan [12], and Euclidian distance functions that are more than once utilized in software testing thinks about [9], [11].Further, we likewise utilized Locality-Sensitive Hashing (LSH) method as a quick gauge of string distance in our work.

A. LEVENSHTEIN DISTANCE

The Levenshtein Distance is an alter put together distance that works based with respect to three alter activities, "erase", "insert", and "update". Every task has a related cost where each string can be converted to the next string dependent on these alter activities.

The distance is the base expense of an arrangement of alter tasks that converts one string into the other string . The Levenshtein distance doles out a unit cost to all alter activities. Numerically, the Levenshtein distance between two strings, Str1 and Str2, is equivalent to lev(Length(Str1), Length (Str2)) where it very well may be determined recursively by

$$
lev(i,j) = \begin{cases} \max(i,j) & \text{if } \min(i,j) == 0 \\ \min \begin{cases} lev(i-1,j)+1 \\ lev(i,j-1)+1 \\ lev(i-1,j-1)+cost(i,j) \end{cases} & \text{otherwise} \end{cases}
$$

$$
cost(i,j) = \begin{cases} 0 & \text{if } Str1_i == Str2_j \\ 1 & \text{otherwise} \end{cases},
$$

whereStr1i denotes the ith character of Str1, and Str2j denotes the jth character of Str2.

B. HAMMING DISTANCE

The Hamming distance [12] was at first acquainted as a measure with figure the distance of good for nothing streams. In any case, it has been adjusted to be utilized for strings [12]. The Hamming distance of two strings, as "abcd" and "anfd", is the quantity of characters diverse in two strings. At the end of the day, each character in the principal string is contrasted and a character in the proportionate position in the second string. In this precedent, the distance is two. In cases where the sizes of two strings are not equivalent, invalid characters (ASCII code of zero) are added as far as possible of the littler string until the two strings have an equivalent size. For instance, the distance among "abdominal muscle" and "acdb" is three[15].

C. MANHATTAN DISTANCE

The Manhattan distance [12] is regularly utilized for vectors of numbers. It likewise can be connected to strings as

$$
\text{Manhattan distance} = \sum_{i=1}^{n} \left| Str1_i - Str2_i \right|
$$

Where Str1i and Str2i are ASCII codes of the ith character. Like the Hamming distance, when the size of the two strings isn't equivalent, invalid characters are added to the shorter string.

D. EUCLIDIAN DISTANCE

The Euclidian distance is like the Manhattan distance. It very well may be connected to strings as

$$\text{Cartesian distance} = \sqrt{\sum_{i=1}^{n} (Str1_i - Str2_i)^2}$$

Again, invalid characters are added to the shorter string until the two strings have an equivalent size.

E. COSINE DISTANCE

The Cosine comparability ascertains the similitude of two vectors as a cosine of the edge of two vectors. The Cosine comparability can be determined as pursues where ASCII codes are utilized as a number.

$$\text{Cosine similarity} = \frac{\sum_{i=1}^{n} Str1_i \times Str2_i}{\sqrt{\sum_{i=1}^{n} Str1_i^2} \times \sqrt{\sum_{i=1}^{n} Str2_i^2}}.$$

Like The Hamming distance, when the size of the two strings isn't equivalent, invalid characters are added to the shorter string. At long last, to ascertain the distance, 1-Cosine comparability is utilized.

F. LOCALITY-SENSITIVE HASHING (LSH)

LHS [24] is a method that can be utilized as a quick estimation of the distance between two strings. The essential thought is to hash strings to such an extent that comparative strings are mapped into an equivalent hash code with a high likelihood. Random projections are center components used to outline input information to an esteem. In this paper, we utilized a sort of random projection that is utilized to gauge cosine distances. This projection is characterized as

$$h^x(\vec{v}) = \begin{cases} 1 & \vec{x} \cdot \vec{v} \geq 0 \\ 0 & \vec{x} \cdot \vec{v} < 0 \end{cases}$$

Where v is the information vector, x is a random vector produced from a Gaussian distribution, and h x (v) is a bit speaking to the area of v contrasted with x. P random projections are utilized to build a hash esteem where it demonstrates the area of the information vector contrasted with the P random vectors. Therefore, we have P bits as a hash esteem; P=32 is utilized in this exploration.

At long last, the Hamming distance is utilized between two hash bit strings which prompts an estimation of the cosine distance of the first strings. LSH improves the runtime request as the Hamming distance between two 32 bit streams is autonomous of the sizes of the strings. A far reaching runtime request investigation is exhibited in the following area.

Cosine and LSH distances are normally standardized against the length of the strings and subsequently, we don't have to standardize them. Be that as it may, the other talked about distances are not normally standardized. To standardize them, the outcome is partitioned by Length(Str1)+Length(Str2).

VI. CONCLUSION

In this paper, black-box string test case generation is examined. Two objectives are acquainted with produce viable string test cases. The principal objective controls the decent variety of the test cases inside a test set. As indicated by different observational examinations, blames as a rule happen in blunder precious stones or disappointment locales. Subsequently, controlling the decent variety of the test cases is an important part of black-box test case generation. The second objective is in charge of controlling the length distribution of the string test cases. The Benford distribution is utilized as an objective distribution. In like manner, a Kolmogorov– Smirnov test is used to develop the wellness work. At the point when the two objectives are enforced, utilizing a multi-objective advancement strategy, prevalent test cases are created.

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Abadent Object Detection & IOT Based Multi-sensor Smart Robot for Surveillance Security System

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ABSTRACT

This paper presents an up-to-datemethod for surveillance in distant and boundary areas using (MR).It is based on the present 4G technology used in defense force and army applications. This automated vehicle has capacity to substitute the solider at outskirt territories to give reconnaissance. The automated vehicle works both as independent and physically controlled vehicle utilizing web as correspondence medium. This MRused to recognize human, bombs, unsafe gases and fire at remote and war field zones.Routinely, remote security robot obsoletes because of constrained recurrence range and restricted manual control. These points of confinement are overwhelmed by utilizing 4G innovation which has unfathomable range.In this robotic vehicle is designed for exploration as well as surveillance under certain circumstances.Interruption form the strangers is automatically sensed by this system and photos are send to the admin that consideredthese type of object is to be taken in the image sensor of SVM algorithm the abundant object has been discovered. The MRis capable for watching the sensor using Passive and also IR Sensor, Gas sensor used to sense the deadly gases, Flame Sensor is used to sense fire or explosion, Temperature sensor is used high temperature range, Object in the boundary is capturing by using camera, Detect any obstacles are sensed by using ultrasonic sensor and tracking the locality by using GPS. Any illegal activities like harmful gases, fire and other dangerous situation are sensed and then transfer to the server. This system senses the unsafe situations near the border and protects the human life without any mortality.

Keywords : GPS; Internet Of Things, Robotics, Surveillance Observing And Wireless Sensor.

I. INTRODUCTION

The robot is fundamentally electro-mechanical machine or gadget that is controlled either by PC program or with electronic circuit to perform assortment of physical undertakings. With the steady improvement of innovation researchers think of new thoughts and developments of robots [1]. In the present life robot are turning out to be basic piece of human life [2]. The mechanical innovation likewise gives mechanization in medical clinic, office and industrial facility. Other than mechanization this innovation likewise employed in Defense powers, Entertainment, Space investigation, Security frameworks and numerous perilous strategic. As the fear is consistently remains India's first adversary in this way, the robots are employed to spare human life. Nations like India are as yet confronting and

facing with normal dangers from dread. Both Kashmir and Mumbai fear assaults have culminated that quite far the future clash will be handle by robot and unmanned machines to ensure human life [4]. At present, the Indian Army has Dash MR to battle in combat zone. As the innovation multiply quickly in robotization field by coordinating Military Robots as Soldiers in war field to lessen complaint and end in war fields [5]. In guard zones, Robot are typically smaller than usual in size sothatare enough competent to enter in passages, mines and little openings in building. It's likewise have ability to get by in unforgiving and troublesome climatic conditions for deep rooted time without causing any mischief [6]

Subsequently a mechanized BS (Border Surveillance) framework has been created to screen the security in the b+orders by utilizing IOT. "MRfor Border Security Surveillance (BSS)", a computerized reconnaissance framework to screen the safety at the outskirts [7]. The framework depends on a MRutilizing different sensors to distinguish interruption utilizing PIR Sensor, harmful gas utilizing Gas sensor,Spark or smoke by utilize the Flame sensor, high hotnessconsuming Temperature sensor, Camera for catching the exercises in the outskirt, any impediments are observed by ultrasonic sensor and GPS for following the area. This framework spares more number of humans [8]. Outskirt gaurd has been a significant worry since quite a while, for our country as well as for the global in general [9]. It secures the nation's boundsoppose illicit growth of products, doctors, missiles and publics [10]. To retain up the interchange and voyaging legitimately just as guard against panic based oppression, all in the world. This assistantsto keep up a nation's budget, security and chance [11].

In the paper remaining part is sorted out as pursues: Sec II reviews a little late papers on Abadent Object Detection (AOD) and Multi-sensor brilliant robot for outskirt safe keepingobservation. In Sec III, ¬¬¬the

itemized portrayal of the AOD & IOT Based MR technique AODMSRBSS is introduced. In Sec 4, the appearance of the AODMSRBSS is evaluated by aimingpreparation of tests. Finally, In Sec V tocomplete the end.

II. LITERATURE SURVEY

In this fragment, an investigation of progressing methods in perception security structure with its ideal location, imperatives are discussed. In this circumstance, brief appraisals of some noteworthy duties to the present techniques are shown.

Lee. et al. [12] proposed a total reconnaissance framework for identifying the nearness of abnormalities (relinquished items) in a jumbled situation. Here they utilize a moving camera connected to a robot stage execution a translational program. The checking framework utilizes a reference object no peculiarities, as specific by a framework administrator in an underlying alignment arrange, comparatively to the underlying stamping. The recognition of odd articles is completed by looking at the objective item, procured in resulting sections of the automated stage, with the underlying reference object. All handling is performed progressively, what requires explicit preparing arrangements and makes the framework reasonable for a wide extent of down to earth circumstances.

DeSouza et.al. [13] Designed a programmed discovery in reconnaissance applications is very broad. In any case, as far as we could possibly know, the particular issue of ongoing recognition of relinquished items with a camera appended to a moving stage in a jumbled situation, for example, an assembling plant, has not been completely tended to yet. Thusly, as the beginning stage of this work we produced an enormous database of observation object is taken from a moving camera in a jumbled Border territories. This database, freely accessible at ABODA is quickly depicted in SEC.3.

Chang et,al.[14]The programmed discovery of deserted articles in a given situation comprises an intriguing component of an observation or remote assessment framework. This location issue can be tended to by looking at a recently gained article, otherwise called the objective item, to a reference object thought about free of relinquished articles. Along these lines, an article oddity, which might be related to a relinquished item, is recognized at whatever point and any place the objective and reference object vary to a noteworthy sum.

Kong, et, al. [15] Designed an option to the additional multifaceted nature presented by the utilization of moving cameras, if the earth to be observed is jumbled, (for example, are modern ,outskirt zones, etc), the way toward sifting through the helpful data from the foundation turns out to be significantly progressively troublesome, by and large decreasing the common recognition power. The identification of still articles with a moving camera with self-assertive direction is the subject of not many works in the writing. Nonetheless, because of the intricate idea of this assignment, none of these strategies can perform progressively.

Vijaykumar, et,al. [16] proposed reconnaissance framework, the composed framework, including the article examination system in a bit by bit method. Proposed framework quickly portrays the dataset to alter and assess the proposed recognition plot. The subtleties of every single explicit arrangement created with regards to this work to upgrade the framework's exhibition, etc as far as computational multifaceted nature and recognition vigor. Depicts the setup of all framework enthusiasm, examining their individual consequences for the subsequent discovery process. In location they displayed describing the framework's presentation in both quantitative and subjective ways. At last, finishes up the paper underscoring its fundamental specialized commitments'.

III. AOD & IOT BASED MR METHODOLOGY

MR for BSS is a robotized framework with various sensors for outskirt security reconnaissance. The framework has structured with 7 squares, for example blocks are (IR, Ultrasonic, Flame, Heat, Gas, Human Detection and Site Detection block).The AOD & IOT Based MR square chart are appeared underneath fig. 1.
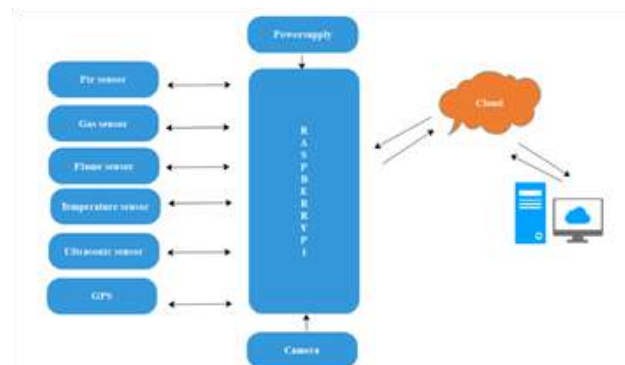
Fig.1. AOD & IOT Based MR for Surveillance Security System.

The proposed (AOD& IOT Based MR) framework clarifies MR for outskirt security observation. This structured framework includes for the fringe security reason, here different sensor is operated to screen. Mainly, below the current situation, as Criminal movement, carrying in, embedding dangerousdevice, fear monger workouts. PIR sensor distinguish the item, the article will perceive the picture and alarm the client. Ultrasonic sensor distinguishes the hindrances and caution the client, fire sensor identifies fire and alarms warring to the client temperature sensor recognizes the temperature it naturally produces the specific temperature and sends the caution to the administrator, gas sensor distinguishes poison gas around the bounders and caution the client, camera is operated to identify reconnaissance around the fringe through website pages it tends to be seen. GPS is operated to follow the area.

A. Sensor Acquisition and processing

To distinguish the living items, in this AOD & IOT Based MR reconnaissance frameworks PIR Sensors is

operated. PIR sensors are worked based warm radiations. The warm radiations are changed over into a voltage esteems and which is given to raspberry pi (RPi). By and large PIR comprise of two distinct conditions, for example, high and low. At whatever point the PIR sensor distinguish the item at the period it will give high condition or else it will bring down conditions this AOD & IOT Based MR observation framework. Ultrasonic sensor is employed to recognize the hindrances dependent on the trigger heartbeat. This impediments recognition framework, on the off chance that it recognize any sort of deterrents implies at the stage it will switch the caution and furthermore its send the suggestion to the reviser framework. A fire identifier is a sensor expected to differentiate and respond to the closeness of a spark, and allowing fire revelation. In this AOD & IOT Based MRobservation framework Fire Sensor are operated to distinguish the spark. Fire sensor gets the contribution from the RPiand that information is changed to the sensor. On the off chance that any fire is distinguished and which alert the client. In the AOD & IOT Based MR reconnaissance framework, this square distinguishes the Hotness and Smoke. Temperature sensor comprises of a somatic that plays out the activity as per temperature this change in real life. This difference in activity is identified by electrical gadget and it computes the heat. At the point when the voltage builds then the temperature additionally increases, when power diminishes the heatdecreases. The proximity of gases in a area is identify by gas sensor, frequently as a feature of a wellbeing framework. This sort of devices is operated to identify a gas fall or dissimilar outflows and can connect with a control framework thus a technique can be consequently closed down. This GPS is applied to follow the present area of the robot. This area following framework help to spare the period and spare human life.

B. Cloud

Conveyed processing is the most mentioned front line development all through the world. It is one of the most critical point whose application is being

inquired about in the present time. One of the noticeable administrations offered in distributed computing is the distributed storage. With the distributed storage, data is put away on several outsider servers, instead of on the committed server operated in conventional arranged information stockpiling. All information put away on different outsider servers isn't minded by the client and nobody knows where precisely information spared. It is minded by the distributed storage supplier that claims that they can secure the information however nobody trusts them. Information put away over cloud and move through system in the plain content organization is security risk. This paper proposes a technique that enables client to store and access the data consistently from the distributed storage. It additionally affirmations that nobody aside from the confirmed client can get to the information neither the distributed storage supplier. This technique guarantees the security and protection of information put away on cloud.

C. Abandoned Object Detection (AOD)

To detect deserted and lifted articles, the exertion is to control fixed areas that have as of late changed in the scene by execution foundation subtraction. The time and event of static articles, which might be either in surrendered or lifted, are set apart on the item feed and might be employed to alarm security initiates. AOD & IOT Based MR framework can identify surrendered protests and is equipped for playing out this continuously. The square sketch of the AOD module is seemed in the fig. 2.

The underlying advance of the AOD is finding the edge differencing between foundation casing and two continuous RGB casing of the article to make two back to back closer view edges to discover moving and recently showed up objects. In that article recognized edge, windowing is applied then the identified item includes are separated and classes are characterized. For instance: consider if the item is distinguished in a that casing contains the line and section size of 1024 X 1024 at the period the identified edge is isolated into 16 squares which

every single square comprise 64 line and 64 segment size. Isolated squares highlights are separated and tried with the SVM classifier. SVM is as of now comprise of preparing information by utilizing that data it characterizes that the recognized item is Suitcase, Bag or human.
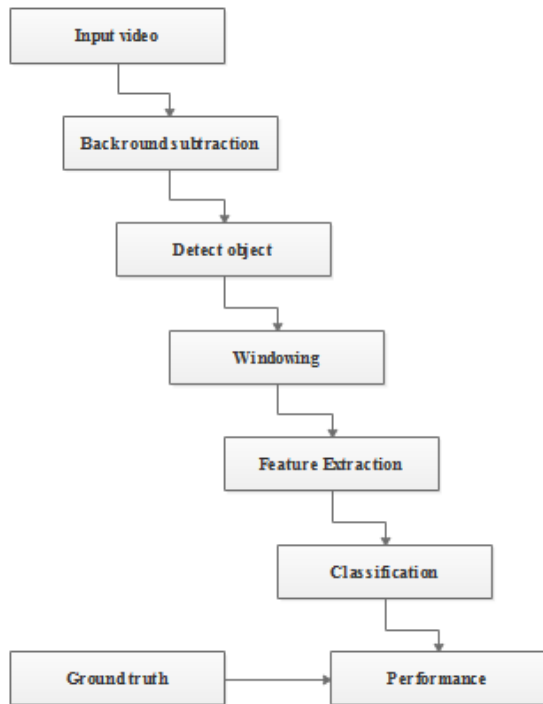
Fig.2. AOD block diagram.

D. Abandoned Objects Dataset

Deserted Objects Dataset (ABODA) is another open dataset for surrendered things identification. ABODA involves 11 classifications marked with different genuine application circumstances that are invigorating for relinquished article identification. The circumstances incorporate swarmed scenes, checked changes in lighting condition, evening location, just as indoor and open air situations. Few images of ABODA Dataset is look in fig.3.AOD & IOT Based MR framework work in the constant yet ADO execution are operated to investigation and to assess ADO dataset.

Fig.3. Sample ABODA images.

1) **Background subtraction & object detection**: Next the obtaining of datasets, frontal area recognition is completed on particularly each edge by utilizing foundation subtraction. The foundation of the picture outer line is dictated by losingthe current edge from the past edge or normal picture of the quantity. Foundation subtraction functions admirably in explicit states of rate and speed, furthermore it is delicate to the limit. The common recipe of foundation subtraction is assumedby Equation. (1).

$$|I_i(x, y) - I_{i-1}(x, y)| > T \qquad (1)$$

Where, is signified as past frame, =present frame and =designated threshold. The example picture of frontal area detection utilizing foundation subtraction is given in the Fig. 3.After closer view location, mass recognition is completed for getting a specific district important to perform further tasks like element extraction, improvement and order. In the use of article identification or item following, the acquired mass district shows the pieces of articles and the nearness of items. Each mass districts are pressed in flat and vertical ways until the whole mass is encased in a square outline box. In this work, the mass identification framework depends on jumping box, focus of-mass and contiguousness pixels. Moreover, the factual highlights of masses like capacity limited by the participation work, area of the inside gravity, pixel check of the mass, and dimension of the rectangular walled in area are likewise determined. Currently, mass discovery have found progressively well known, in light of the fact that it utilizes intrigue focuses for wide baselines stereo coordinating and furthermore for flagging the nearness of instructive image highlights for presence put together article recognition with detail to the premise of nearby picture insights. The example picture of mass identification is spoken to in the Fig. 9. The distinguished masses are exploited component extraction by utilizing half breed include extraction.

2) **Feature extraction:** Normally, include removal is characterized as the activity of charting the picture from picture gap to highlight space and it

additionally changes the enormous repetitive information into a decreased information portrayal. It diminishes the intricacy of the framework. In this examination study, include extraction is performed based on (1.HOG, 2.GLCM, 3. STIP, 4.DWT 5.SIFT). The nitty gritty portrayal about the component descriptors are agreed beneath.

3) Histogram of oriented gradients: For the most part, HOG depicts about the circulation of spatial bearings in each picture area. It abuses the nearby item appearance, which is all around described by the circulation of edge bearings or neighborhood force slopes. The common thought of HOG is to partition the picture into little spatial areas and for every locale it makes single dimensional inclination direction histogram with slope course and angle extent. A key trait of HOG include is equipped for catching the neighborhood presence of items, and furthermore to account the invariance in things changes and brightening condition. The edge data about slopes are dictated by put on HOG highlight vector.A gradient operator is employed at the first to compute the gradient value. The gradient point of the image is indicated as and the image frames are denoted in the Equation. (2).

$$G_x = N * I(x, y) \text{ and } G_y = N^T * I(x, y) \qquad (2)$$

Image detection windows are categorized into various minor spatial regions, which called as cells. Hence, the magnitude grades of the pixels are experienced with edge orientation. Finally, the magnitude of the grades is denoted in the Equation. (3).

$$G_x(x, y) = \sqrt{G_x(x, y)^2} + \sqrt{G_y(x, y)^2} \qquad (3)$$

Edge positioning of the point is identified in the Equation. (4).

$$\theta(x, y) = tan^{-1} \frac{G_y(x, y)}{G_x(x, y)} \qquad (4)$$

Here, is stated as the flat direction of gradients and is represented as the perpendicular direction of gradients. For unrivaled invariance in enlightenment and commotion, a standardization methodology is achieved, after the count of histogram esteems. Standardization is a major advance in the HOG include descriptor, it keeps up discriminative qualities and perform reliably even against parameters like foundation closer view differentiation and neighborhood enlightenment varieties in the info picture. Standardization is finished by utilizing "hinder" as a crucial district of activity. Each square locale involves a square exhibit of 4 cells. By each square is characterized with a half cover with the past square. Standardization successfully keeps up the cell-based nearby inclination data, it's different to neighborhood enlightenment settings. In HOG, four exclusivelikes of normalizations are accessible, for four example standards are,(L2-standard, L2-Hys, L1-Sqrt and L1-standard).Between these types, L2-standard providessuperiorperformance in walker recognition and characterization, which is scientifically given in the Equation. (5).

$$L_{2-norm} : f = \frac{x}{\sqrt{\|x\|_2^2 + e^2}} \qquad (5)$$

Where, is meant as less positive value, is signified as feature mined value, denote as non-normalized vector in histogram blocks and denotes the 2-norm of HOG.

4) GLCM: Recurrence of pixel setsis decide by theGLCM descriptor, when the pixel force regards are correspondent. Examination study for GLCM descriptor contains autocorrelation, differentiate, bunch unique quality, set conceal, divergence, vitality, homogeneity, maximum likelihood, sum of squares, fluctuation, total normal, total change, total entropy, contrast difference, distinction entropy, data proportion of association, converse contrast, reverse distinction unvarying and opposed contrast miniature standardized [17].

5) SIFT: It gives the pictures of an item, which are without airs by the item scaling and revolution. Filter scheminginclude of 4 phase extrication approaches, that are Scale-Space Extrema Detection ,Key point Localization, Orientation Assignment and Descriptor [18].

6) DWT: Thismethod of technique has things like superior compression energy and perfect reconstruction with littleprovision filters, less computation and no redundancy. It surveys the fuzzy de-noising procedure, which delivers shift capable sub-bands and directional selectivity is best with less redundancy. The real input images $\frac{x}{\sqrt{||x||_2^2 + e^2}}$ at resolution 2^{j+1} decompose into 4-subband pictures in the frequency field. Three sub-band images such as $D_{2^i}^h f, D_{2^i}^x f, D_{2^i}^d f$. These are the brain tumor images at resolution in perpendicular, flat and sloping between the 4-subband images. The approximation image is the fourth image, $A_{2^i} f$ detected coarse resolve. So, the whole input image $A_{2^{j+1}} f$ is dedicated in the Eq. (6).

$$A_{2^{j+1}} f = D_{2^i}^h f + D_{2^i}^v f + D_{2^i}^d f + A_{2^i} f \qquad (6)$$

The decomposed mammogram sub-images are the 2-D orthogonal wavelet. The results of the wavelet decomposition of a mammogram picture is resultant into 4-orthogonal sub-bands such as L-L band, L-H band, H-L band and H-Hband, where H denote high and L denote low which is represented as and respectively.

7) STIP: It is a most real technique is to remove occupant highlights at space-time intrigue focuses and encode the transient data straightfordly keen on the neighborhood include. This outcomes into the meaning of spatial-fleeting nearby highlights that embed existence mutually. Space period intrigue point finders are postponements of 2Dimension consideration point locators that fuse fleeting data [19].

8) Classification: In this AOD & IOT Based MR system technique for AOD and ACR, SVM is used as a classifier. As well as it is used as a Classifier. In the below section SVM algorithm are briefly explained.

9) Support vector machine: After element Extraction, arrangement is done utilizing SVM, which permits an efficient route of extracting the features and a set of rules to perform classification.

SVM is a discriminative grouping approach represented by a separate hyper-plane. The SVM classifier widely used in more number of applications like bioinformatics, signal processing, computer vision fields, etc., Due to its much performance in correctness, and capability of processing the high dimensional data. SVM does well in solving two-class issue, which is associated with the theories of vapnik–chervonenkis and construction principles. The broad formula for the linear discriminant function (DF) is denoted as . In order to distinct the samples without noise, an optimum hyperplane is exploit between the two groups, which is mathematically given in the Eq. (7).

$$pi[w.x + b] - 1 \geq 0, i = 1,2,..N \qquad (7)$$

Then, reduce in the Eq. (7), so the saddle point of a Lagrange function with Lagrange multipliers to solved theoptimization. The ideal DFis denoted in the Equation. (8),

$$f(x) = sign\{(w^*x) + b^*\} = sign\{\sum_{i=1}^N \alpha_i^* . pi(x_i^* - x) + b^*\} \qquad (8)$$

Finally, interior product is replace by a linear kernel in the Eq. (8) to minimize the computational difficulty in higher dimensional data. In this mode, the linear separability of expected samples improved and the DFis re-written as given in the Equation. (9).

$$f(x) = sign\{\sum_{i=1}^N \alpha_i^* . pi. k(x, x_i) + b^*\} \qquad (9)$$

IV. RESULTS AND DISCUSSION

AOD & IOT Based MR system are implemented with the help of RPi. The RPiis a series of small single-board computers. it has 40 pins, the pins are GPIO (general purpose input output) the board is generate by the pins voltage and input are send to the board after processing it gives output.The AOD & IOT Based MR ADO has been tested utilizing Python with processor range is Intel i3 processor, size of hard disk is 1TB and RAM size is 8 GB. For determining the viability of the AOD & IOT Based MR proposed framework the presentation of the AOD & IOT Based MRis contrasted and the present frameworks on the dataset ABODA.

A. Advantage of RPi

In spite of the fact that RPi is as little as the size of a charge card, it fills in as though a typical PC at a generally low cost. It is possible to fill in as a negligible exertion server to manage light inward or web traffic. Gathering a lot of RPi to fill in as a server is more practical than a typical server. On the off chance that all light traffic servers are changed into RPi, it can positively limit a venture's move. AOD & IOT Based MR framework are ordered into testing, there are two kind of testing, they are Hardware trying. Also, recreation testing.

B. Hardware testing

The hardware testing (HT) is successfully completed and the photo copy of the HTis attached below, the sensor which are given in the table are used in this AOD & IOT Based MR system.

Tabele.1.Sensor and its model

Sensor	Model
PIR sensor	model/50774
Gas sensor	TGS21
Temperature sensor	CNY70
Ultrasonic sensor	BE-000006
Flame sensor	Ky-026

This AOD & IOT Based MR method is implemented using hardware testing. HTis successfully completed and it is working successfully.

Fig.4. Hardware results

C. Simulation Testing

In this simulation testing AOD is used, in this performance analysis, recall precision is used

D. Performance Analysis

From the AOD & IOT Based MR system has 4 parameters that are True Positive True Negative, False Positive and False Negative are calculated. By calculating the performance to use this parameters are TP, TN, FP and FN. The such performance parameters investigated in this AOD & IOT Based MR method are labeled as below.

Recall: is the totalnumber of   divided by the totalnumber of   and the total numberof . Equation (10) showed the Recall mathematical equations.

$$R = \frac{tp}{tp+fn} \qquad (10)$$

Precision: is the sum of tp divided by the sum of and FP. It called asPositive Predictive (PP) Value. Equation (11) showed Precision exact equations.

$$Precision = \frac{tp+tn}{tp+tn+fp+fn} \qquad (11)$$

E. Quantitative and comparative analysis on ABODA dataset

In this unit, ABODA dataset is assessed for evaluating the presentation of the AOD & IOT Based MRskill. The discovery of action in the ABODAdataset is represented in the Fig.5.

Fig.6. AOD.

Fig.7. Detected Abandoned object detection.

Tab 2. Relativeexamination of proposed and existing tasks in ABODA dataset

Year	Method	Dataset	Precision	Recall
2015	AOD based classification [20]	ABODA	66.67%	100%
2019	Proposed system	ABODA	80.51%	100%

In Table 2, the proposed system technique AODperformance is validated by means of Precision and Recall. In that AODbased Classification [20] existing system provides 66.67% of Precision and 100% Recall. As Welles proposed technique provides 100% of recall and 80.51% of Precision. Compared to the existing [20] Proposed system Technique provides 20% of better Precision.
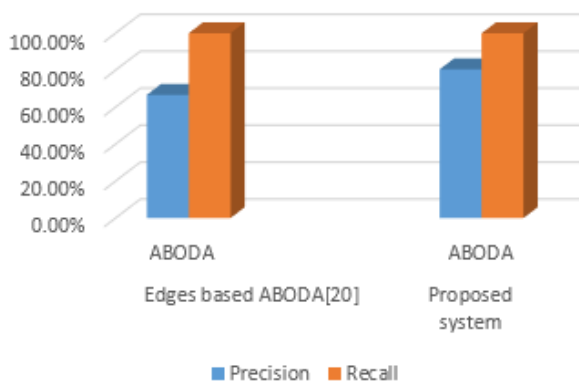
Fig.8. Comparative analysis.

V. CONCLUSION

Another framework is created in this work to identify AOD in the item utilizing troop movement design. The fundamental point of this examination is to get the AOD & IOT Based MR framework utilizing ABODA dataset. In this exploration paper. The ideal component data is given as the contribution for SVM classifier are employed in the items., the AOD & IOT Based MR framework conveyed a powerful presentation by methods for, accuracy, review exactness. Robots are employed to show the fringes to spare the human more bit of leeway of this strategy is that if there is security break at the cloud supplier, the client's information will keep on being secure since all information is scrambled. Clients additionally need not to stress over cloud suppliers accessing their information wrongfully.

Crop Health Monitoring System Using Machine Learning

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ABSTRACT

In this changing environment, appropriate and timely disease identification including early prevention has never been more important. There are several ways to detect plant pathologies. Some diseases do not have any visible symptoms, or the effect becomes noticeable too late to act, and in those situations, a sophisticated analysis is obligatory. However, most diseases generate some kind of manifestation in the visible spectrum, so the naked eye examination of a trained professional is the prime technique adopted in practice for plant disease detection. In order to achieve accurate plant disease diagnostics a plant pathologist should possess good observation skills so that one can identify characteristic symptoms

To find out whether the leaf is diseased or healthy, certain steps must be followed. i.e., Preprocessing, Feature extraction, Training of classifier and Classification. Preprocessing of image, is bringing all the images size to a reduced uniform size. Then comes extracting features of a preprocessed image which is done with the help of HOG .HoG is a feature descriptor used for object detection. In this feature descriptor the appearance of the object and the outline of the image is described by its intensity gradients. One of the advantage of HoG feature extraction is that it operates on the cells created. Any transformations doesn't affect this.

I. INTRODUCTION

Plant disease detection is an Innovative and Enlightening System helping the users to know the disease, trainings or any interesting things taking place around their Area. This Organization aids the native community to keep themselves up to date about the events around their locality or zone or in their town. There are 2 things for this method to work; one for the image processing and another is machine learning.

The user is permitted to sight the disease only of his town while user can supplement disease connected to any town. Admin will show if any misuse or inappropriate or false disease added by any users and will take specific act. The Front end used is Android Studio and backend as SQL Server. The user has to record into the system to using this app and can bring up-to-date his details as well.

The healthy leaf is shown first and so on, the user can also restore the disease resultant the latest one shown first and current disease will be shut. The user can add a image and a title connected to the leaf.

System Architecture

The user can use only 500 words to give a lecture on disease. The Appearance and texture of evaluation the disease is thrilling and amazing as the system offers swipe to move to the next or earlier disease with transition properties.

The agriculturist in provincial regions may think that it's hard to differentiate the malady which may

be available in their harvests. It's not moderate for them to go to agribusiness office and discover what the infection may be. Our principle objective is to distinguish the illness introduce in a plant by watching its morphology by picture handling and machine learning.

Pests and Diseases results in the destruction of crops or part of the plant resulting in decreased food production leading to food insecurity. Also, knowledge about the pest management or control and diseases are less in various less developed countries. Toxic pathogens, poor disease control, drastic climate changes are one of the key factors which arises in dwindled food production.

Various modern technologies have emerged to minimize postharvest processing, to fortify agricultural sustainability and to maximize the productivity. Various Laboratory based approaches such as polymerase chain reaction, gaschromatography, mass spectrometry, thermography and hyper spectral techniques have been employed for disease identification. However, these techniques are not cost effective and are high time consuming.

In recent times, server based and mobile based approach for disease identification has been employed for disease identification. Several factors of these technologies being high resolution camera, high performance processing and extensive built in accessories are the added advantages resulting in automatic disease recognition.

Modern approaches such as machine learning and deep learning algorithm has been employed to increase the recognition rate and the accuracy of the results. Various researches have taken place under the field of machine learning for plant disease detection and diagnosis, such traditional machine learning approach being random forest, artificial neural network, support vector machine(SVM), fuzzy logic, K-means method, Convolutional neural networks etc.

Random forests are as a whole, learning method for classification, regression and other tasks that operate by constructing a forest of the decision trees during the training time. Unlike decision trees, Random forets overcome the disadvantage of over fitting of their training data set and it handles both numeric and categorical data.

The histogram of oriented gradients (HOG) is an element descriptor utilized as a part of PC vision and image processing for the sake of object detection. Here we are making utilization of three component descriptors:

1. Hu moments
2. Haralick texture
3. Color Histogram

Hu moments is basically used to extract the shape of the leaves. Haralick texture is used to get the texture of the leaves and color Histogram is used to represent the distribution of the colors in an image.

The agriculturist in provincial regions may think that it's hard to differentiate the malady which may be available in their harvests. It's not moderate for them to go to agribusiness office and discover what the infection may be. Our principle objective is to distinguish the illness introduce in a plant by watching its morphology by picture handling and machine learning.

Pests and Diseases results in the destruction of crops or part of the plant resulting in decreased food production leading to food insecurity. Also, knowledge about the pest management or control and diseases are less in various less developed countries. Toxic pathogens, poor disease control, drastic climate changes are one of the key factors which arises in dwindled food production.

Various modern technologies have emerged to minimize postharvest processing, to fortify agricultural sustainability and to maximize the productivity. Various Laboratory based approaches such as polymerase chain reaction, gaschromatography, mass spectrometry, thermography and hyper spectral techniques have been employed for disease identification. However, these techniques are not cost effective and are high time consuming.

In recent times, server based and mobile based approach for disease identification has been

employed for disease identification. Several factors of these technologies being high resolution camera, high performance processing and extensive built in accessories are the added advantages resulting in automatic disease recognition

Plant disease detection is a portable system which runs under automaton stage which is established with native Java language. App will run smoothly and very fast.

Google Material Design is implemented because of which app looks more attractive and beautiful with good user impression and experience. Combined with admin and user it manages news, various category, notification and many things whenever we want. Main preference is good code with good design.

We can save money and time by using this app and we can create our own design and special apps or different kind of app based on our requirements.Plant disease detection is an Innovative and Enlightening System helping the users to know the disease, trainings or any interesting things taking place around their Area. This Organization aids the native community to keep themselves up to date about the events around their locality or zone or in their town.

There are 2 things for this method to work; one for the image processing and another is machine learning. The user is permitted to sight the disease only of his town while user can supplement disease connected to any town. Admin will show if any misuse or inappropriate or false disease added by any users and will take specific act. The Front end used is Android Studio and backend as SQL Server. The user has to record into the system to using this app and can bring up-to-date his details as well. The healthy leaf is shown first and so on, the user can also restore the disease resultant the latest one shown first and current disease will be shut. The user can add a image and a title connected to the leaf.

II. RELATED STUDY

To find out whether the leaf is diseased or healthy, certain steps must be followed. i.e., Preprocessing,

Feature extraction, Training of classifier and Classification. Preprocessing of image, is bringing all the images size to a reduced uniform size. Then comes extracting features of a preprocessed image which is done with the help of HOG .

HOG is a feature descriptor used for object detection. In this feature descriptor the appearance of the object and the outline of the image is described by its intensity gradients. One of the advantage of HoG feature extraction is that it operates on the cells created. Any transformations doesn't affect this.

Innovative and useful system helps the users to know the disease, traineeships or any motivating things happening around the zone. This system also helps to preserve ourselves up to date about what is trendy around the town. The user is allowed to see the disease, can input many disease connected to any place. Admin will look after if any misuse or unrelated or bogus disease is updated by any members and will take some act. The technique that is used is machine learning and image processing. The user has to record into the system to using this app and can bring up-to-date his details as well.

The up-to-date disease is shown first and so on, the user can also restore the disease resultant the latest one shown first and current disease will be shut. The user can add a image and a title connected to the news.
The user can use only 500 words to give a lecture on news. The Appearance and texture of evaluation the disease is thrilling and amazing as the system offers swipe to move to the next or earlier with transition.

III. SCOPE

In short, we can read day-to-day disease hunt, immediately it saves our time and we can keep ourselves informed on latest disease that are affecting the leaves in day to day life in short. This single project serves many users to view several disease.

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Feature extraction, Training of classifier and Classification. Preprocessing of image, is bringing all the images size to a reduced uniform size. Then comes extracting features of a preprocessed image which is done with the help of HOG .HoG is a feature descriptor used for object detection. In this feature descriptor the appearance of the object and the outline of the image is described by its intensity gradients. One of the advantage of HoG feature extraction is that it operates on the cells created. Any transformations doesn't affect this.

Here we made use of three feature descriptors.

Hu moments: Image moments which have the important characteristics of the image pixels helps in describing the objects. Here Hu moments help in describing the outline of a particular leaf. Hu moments are calculated over single channel only. The first step involves converting RGB to Gray scale and then the Hu moments are calculated. This step gives an array of shape descriptors.

Haralick Texture: Usually the healthy leaves and diseased leaves have different textures. Here we use Haralick texture feature to distinguish between the textures of healthy and diseased leaf. It is based on the adjacency matrix which stores the position of (I,J). Texture is calculated based on the frequency of the pixel I occupying the position next to pixel J. To calculate Haralick texture it is required that the image be converted to gray scale.

Color Histogram: Color histogram gives the representation of the colors in the image. RGB is first converted to HSV color space and the histogram is calculated for the same. It is needed to convert the RGB image to HSV since HSV model aligns closely with how human eye discerns the colors in an image. Histogram plot [8] provides the description about the number of pixels available in the given color range

IV. PROBLEM DEFINITION

The problem of efficient plant disease protection is closely related to the problems of sustainable agriculture and climate change. Research results indicate that climate change can alter stages and rates of pathogen development; it can also modify host resistance, which leads to physiological changes of host-pathogen interactions. The situation is further complicated by the fact that, today, diseases are transferred globally more easily than ever before. New diseases can occur in places where they were previously unidentified and, inherently, where there is no local expertise to combat them .

Inexperienced pesticide usage can cause the development of long-term resistance of the pathogens, severely reducing the ability to fight back. Timely and accurate diagnosis of plant diseases is one of the pillars of precision agriculture

Shortened disease extracts from plants, every story to be printed as a short disease for the viewers. The viewers can luckily flip through the short sections as they want. Share disease and exciting sections with friends and family. The user is simplified with everything going around his town. Easy to use. The user can shot to the admin if the disease is not applicable or honest.

· Because of winter season it is difficult to protect mo leaves.
· The user can't sight the disease of different towns.
· User can add only one image per plant

V. MODULE DESCRIPTION

Image processing

It is used by some researchers for detection and classification of wheat leaf disease. The steps of leaf diseases detection and classification are given below:

1. Image acquisition.
2. Preprocessing.
3. Segmentation of infected regions.
4. Feature extraction
5. Feature selection

```
┌─────────────────────────────┐
│         LEAF IMAGE          │
└─────────────────────────────┘
               ⇩
┌─────────────────────────────┐
│      IMAGE ACQUISITION      │
└─────────────────────────────┘
               ⇩
┌─────────────────────────────┐
│    IMAGE PRE-PROCESSING     │
└─────────────────────────────┘
               ⇩
┌─────────────────────────────┐
│     IMAGE SEGMENTATION      │
└─────────────────────────────┘
               ⇩
┌─────────────────────────────┐
│     FEATURE EXTRACTION      │
└─────────────────────────────┘
               ⇩
┌─────────────────────────────┐
│   SAVE FEATURES & APPLY     │
│      MACHINE LEARNING       │
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```
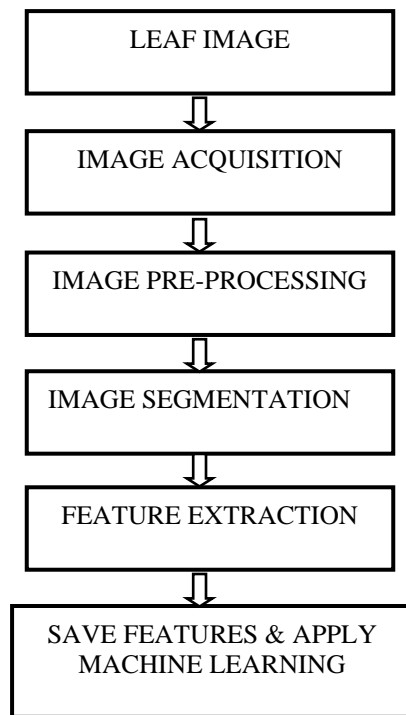
Figure : Block Diagram of Plant Disease Detection

1. Image Acquisition-

The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement.

2. Image Pre-Processing

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them.

It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

· Importing the image with optical scanner or by digital photography.

· Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

· Output is the last stage in which result can be altered image or report that is based on image analysis.

3. Image Segmentation-

Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super-pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s).

4. Feature Extraction-

In machine learning, pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is a dimensionality reduction process, where an initial

set of raw variables is reduced to more manageable groups (features) for processing, while still accurately and completely describing the original data set.

When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection. The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

5. Feature Selection-

In machine learning and statistics, feature selection, also known as variable selection, attribute selection or variable subset selection, is the process of selecting a subset of relevant features (variables, predictors) for use in model construction. Feature selection techniques are used for four reasons:

· simplification of models to make them easier to interpret by researchers/users,

· shorter training times,

· to avoid the curse of dimensionality,

· enhanced generalization by reducing overfitting (formally, reduction of variance)
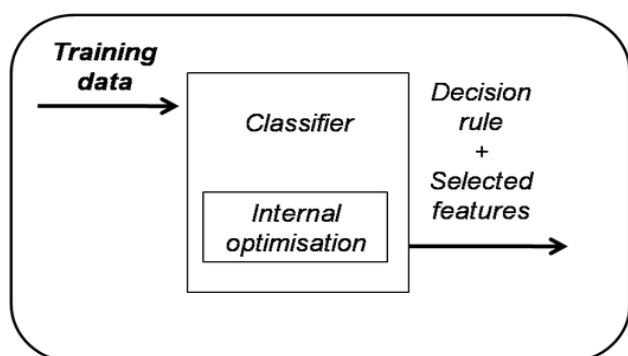
6. Machine Learning Algorithm-

SUPPORT VECTOR MACHINE (SVM)-

They were extremely popular around the time they were developed in the 1990s and continue to be the go-to method for a high-performing algorithm with little tuning. In machine learning, support vector machine are a set of supervised learning models with associated learning algorithms that analyses data used for Classification and regression analysis. When data are not labeled supervised learning is not possible. It constructs a hyper lane and a set of hyper lane which in a high and infinite dimensional space, which can be used for other task like outlier detection.

ADVANTAGES-

· Effective in high dimensional spaces.

· Still effective in cases where number of dimensions is greater than the number of samples.

· It is also memory efficient.

· Versatile.

· Support vector machine (SVM) it analyses the data after that it classify that data and then the regression is done.

· Two main parameters accuracy and detection time in these two the disease is detect.

· Support vector machines (SVM) increase the recognition rate
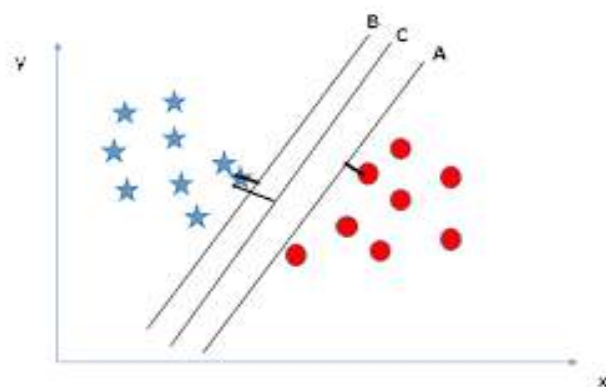
Figure : SVM Model

NEURAL NETWORKS

The disease detection techniques are based on two main neural network technologies: Self-Organising map and multilayer perceptrons (the most widely used architecture).Neural network is a system of hardware and/or software patterned after the operation of neurons in the human brain. Neural network also called artificial neural network.
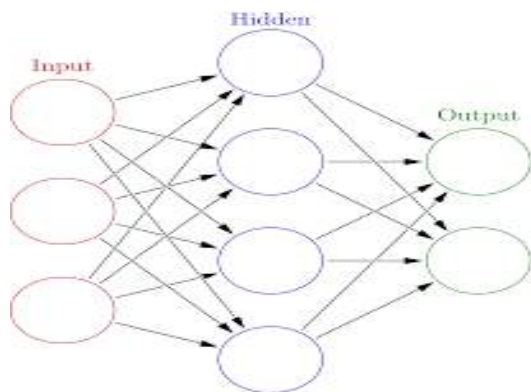
Figure: Neural Network

Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse.

ADVANTAGES-

· Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.

· Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.

· Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.

· Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

Random Forest Classifier-

Random forests or random decision forests are an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. Random decision forests correct for decision trees' habit of over fitting to their training set.

Random forest classifier creates a set of decision trees from randomly selected subset of training set. It then aggregates the votes from different decision trees to decide the final class of the test object.

The advantages of random forest are:

· It is one of the most accurate learning algorithms available. For many data sets, it produces a highly accurate classifier.

· It runs efficiently on large databases.

· It can handle thousands of input variables without variable deletion.

· It gives estimates of what variables are important in the classification.

· It generates an internal unbiased estimate of the generalization error as the forest building progresses.

It has an effective method for estimating missing data and maintains accuracy when a large proportion of the data are missing.
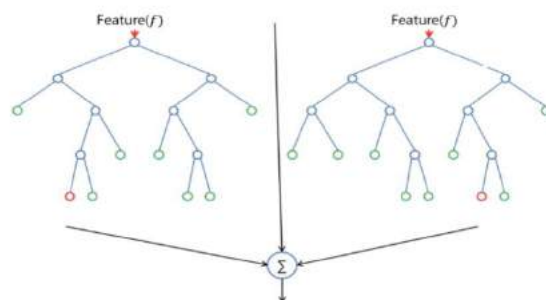
Figure : Random Forest Classifier

HOG (Histogram of Oriented Gradients)-

The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy.
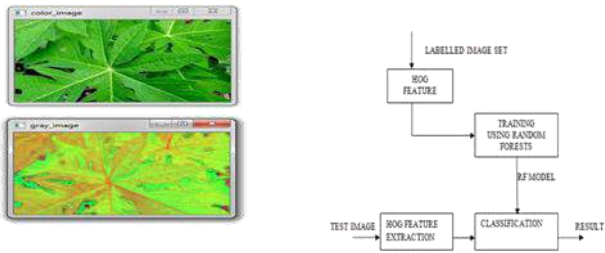
Figure: HOG Diagram

HoG is a feature descriptor used for object detection. In this feature descriptor the appearance of the object and the outline of the image is described by its intensity gradients. One of the advantage of HoG feature extraction is that it operates on the cells created. Any transformation doesn't affect this.

VI. EXPERIMENTAL RESULTS
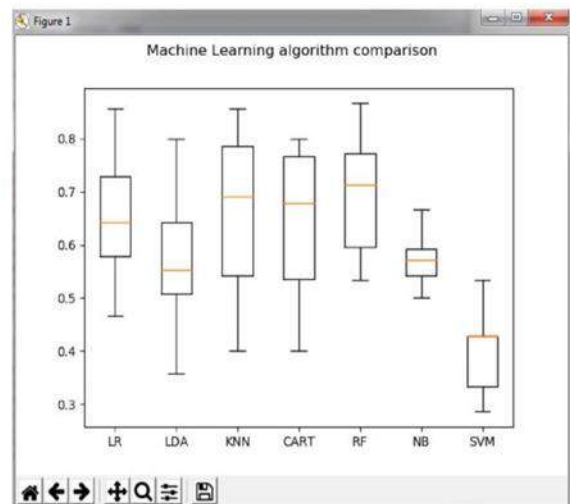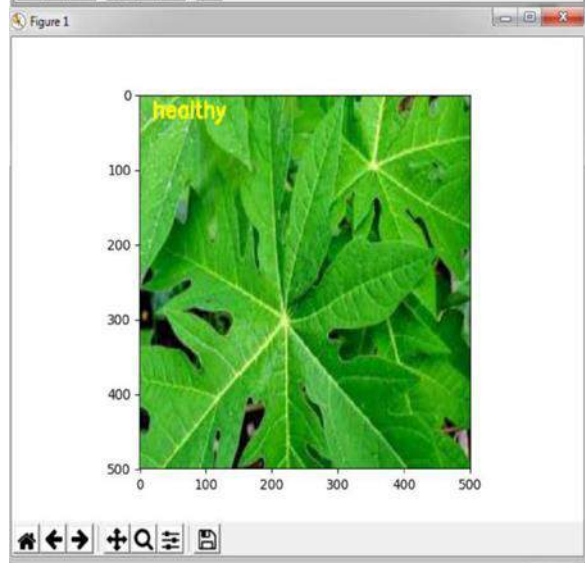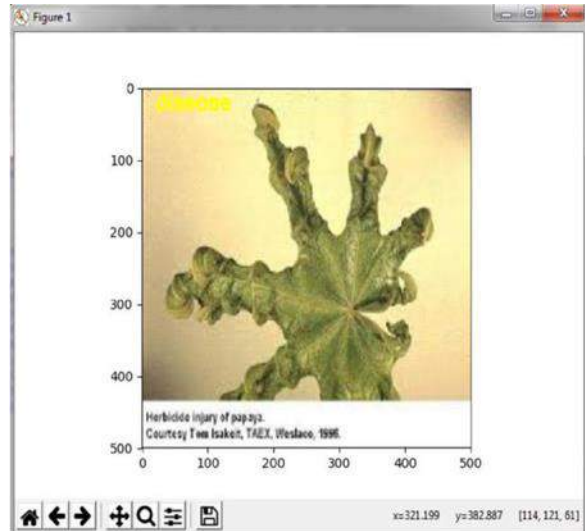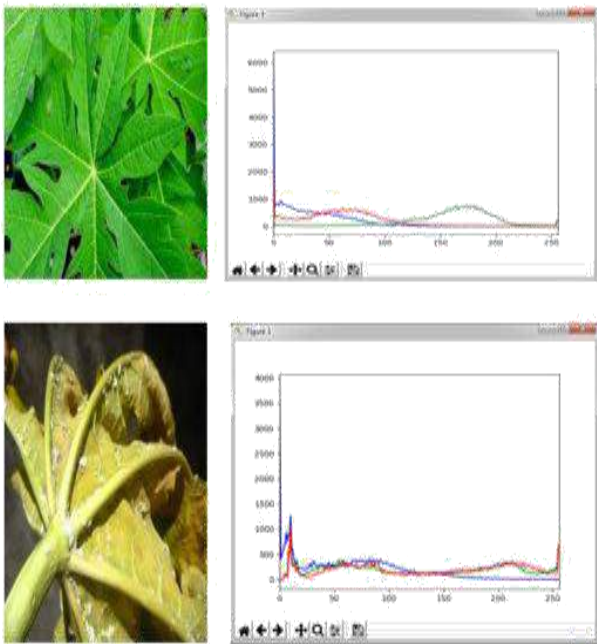
Figure: Final output of the classifier & Comparison with other models

VII. CONCLUSION

Overall idea is to detect whether it is diseased or healthy leaf with the help of a Random forest classifier. The objective of this algorithm is to recognize abnormalities that occur on plants in their greenhouses or natural environment. The image captured is usually taken with a plain background to eliminate occlusion. The algorithm was contrasted with other machine learning models for accuracy. Using Random forest classifier, the model was trained using 160 images of papaya leaves. The model could classify with approximate 70 percent accuracy. The accuracy can be increased when trained with vast number of images and by using other local features together with the global features such as SIFT (Scale Invariant Feature Transform), SURF (Speed Up Robust Features) and DENSE along with BOVW (Bag Of Visual Word).

There are many methods in automated or computer vision plant disease detection and classification process, but still, this research field is lacking. In addition, there are still no commercial solutions on the market, except those dealing with plant species recognition based on the leaves images.

Future enhancement for this is to implement a cloud storage in order to consists of the results of plant disease defect detection which has to be sent to the farmers so as to they can use the right fertilizers for that particular disease.

Detection and Classification of Human Stress Analysis using EEG Signals

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ABSTRACT

In day to day lifestress plays significant role in the quality of human life. Emotion plays a major role in motivation, perception, cognition, creativity,attention, learning and decision-making.In recent years, stress analysis by using electro-encephalography (EEG) signalshas emerged as an importantareaof research. EEG signalsare one of the most important means of indirectly measuring the state of the brain. EEG (Electroencephalogram) signal is a neuro-signal which is produced due the different electrical exercises in the mind. These signals canbe captured and processed to get the necessary data which can be used to detect some psychological changes in early stage. In this proposed system, EEG signal dataset is pre-processed and components with ocular effect are extracted from the EEG signal. Classification of stress level is accomplished by applying SVM (Support-Vector Machine) algorithm which gives the better accuracy.

Keywords : Stress analysis, EEG signals, ocular effect, feature extraction, classification, SVM

I. INTRODUCTION

Stress is a body's method for reacting to a challenge. Human stress can have an impact on aperson's mental and physical well - being. Stress can lead to a change in behavior and in physiology. Many people suffer from stress in everyday life. Stress is related to human work in one way or other. Stress originates from different sources such as time pressure while working in company, responsibility, economic problem or physical factors such as noise. Signs of stress of a human being are tension, anxiety, anger, frustration or irritation by things over which he has no control.

According to the World Health Origination (WHO), stress is the major problem of human being and it has large effect on physical as well as mental health. Stress detection is an on-going research topic among both psychologists and engineers. Wearable sensors and bio signal processing technologies are developed for detecting the human stress. There are various bio signal processing technologies use for human stress detection such as Electroencephalography (EEG), Electrocardiography (ECG), Electromyography (EMG), Blood Pressure (BP), Blood Volume Pulses (BVP), Galvanic Skin Resistance (GSR), Respiration and Skin Temperature (ST) etc.A few methodologies utilize the temperature of the finger [15], human signals [16] and eye squint [17] as a methodology to identify stress. Late methods utilize warm imaging [18], physiological signals [19,20] for stress recognition. Identification of stress is a standout among the best research topic point for psychologists as well as engineers also.There are three kinds of stress:

Acute Stress: This stress is for short time span in which some energy present and bring thrill. for example roller coaster ride.

Episodic Stress: This stress is for longer span of time in which individuals makes self-harm or having absurd demands or stressing.

Chronic Stress: This stress is for long haul, which results in unfortunate and hazardous for human well being.

EEG signal gets captured by EEG MindWave Neurosky headset and these signal get separated according to the recurrence ranges, to be specific delta(1-4 HZ), theta(4-8 Hz),alpha(8-13 Hz), beta (13-20 Hz) and gamma (generally >20Hz).Voltage fluctional of the scalp is somewhere in the range of 20 and 100uV[15].These EEG signals are captured utilizing various electrodes normally accessible in clinics. These electrodes are place on the scalp, utilizing 10:20 technique to catch flag. Primary aim of this undertaking is to build up a convenient and ease ongoing framework for gathering as well as analyzing of the signal for the discovery of stress level of human.

The traditional stress recognition framework is based on physiological signs and outward appearance techniques. The real disadvantage is the vulnerability that ascents because of various outer variables like sweating, room temperature, anxiety. Some strategies like hormone investigation have a downside of obtrusive procedure. There is requirement for a strategy that is non-intrusive, precise, accurate and reliable. This research work expects to identify stress dependent on EEG as EEG shows a decent connection with stress.

II. LITERATURE SURVEY

Studies involving the stress analysis using EEG signals and implementing the techniques can be found in literature. Fast Fourier Transform (FFT), Discrete Wavelet Transform (DWT), Discrete Cosign Transform (DCT) and so on can be utilized for highlight extraction previously ordering the information. Sulaiman et al. [16] proposed a mix of

EEG Asymmetry and Spectral Centroids strategies to distinguish one of a kind example of human pressure. Ghostly Centroids procedure was broadly utilized in discourse and sound acknowledgment as a result of its strength to perceive the prevailing recurrence [17-19]. Poulus et al. [20] utilized EEG phantom power and mean recurrence of Alpha band as a component to NN (Neural Network) so as to recognize individual's trademark. Additionally, kNN classifier was utilized to identify and group human identity and attributesfrom the EEG flag design when tuning in to music [21-24].

III. PROPOSED SYSTEM

In this proposed system, EEG signal dataset is pre-processed using Notch filter. ICA (Independent component analysis) is applied to pick the component with ocular effect. And then Hilbert Transform is applied for feature extraction. Classification of stress level is done by implementing SVM (Support-Vector Machine) algorithm which will provide the better accuracy.

A.EEG Signals

Electroencephalography is a medicinal imaging strategy that peruses scalp electrical action produced by cerebrum structures. The electroencephalogram (EEG) is characterized as electrical movement of a substituting type recorded from the scalp surface in the wake of being grabbed by metal terminals and conductive media.EEG signal comprises of various mind waves reflecting cerebrum electrical action as indicated by terminal positions and working in the neighboring cerebrum areas.Along these lines electroencephalographic perusing is a totally non-obtrusive strategy that can be connected more than once to patients, typical grown-ups, and kids with for all intents and purposes no hazard or restriction A remote EEG gadget, which is a head set was set by universal 10-20 framework.The terminals were appended to the scalp at position AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8 and AF4 as appeared in Figure1.
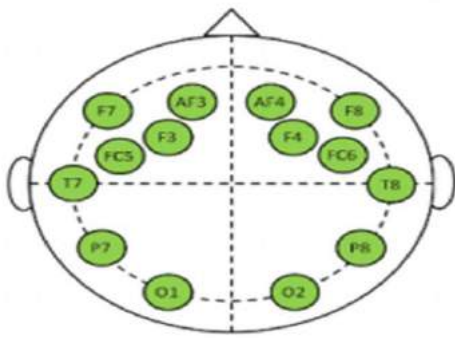
Figure 1. Electrode placement on the scalp.

One of the essential commotion (ancient rarities), that is Ocular relic expulsion is disposed in the process. The EEG rhythms lie in the recurrence scope of 0.3 Hz to 44 Hz. The visual relic happens at 0.1-16 Hz.
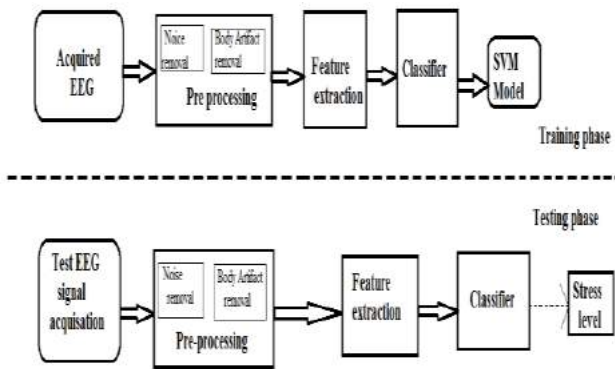
B. EEG Pre-Processing

Raw EEG is contaminated with noise from different form and sources. As EEG has very small amplitude, filtering out unwanted noise is a critical step to extract useful information. Ocular artefacts that arise due to body movement areeliminated.The notch is a very selective filter with a very high rejection just for a tiny frequency band around the selected frequency. It will not attenuate other frequencies, which belong to the EEG signal.Notch filter is utilized to dismiss the 60 Hz or 50 Hz electrical cable amplitude.

C. ICA to pick the Component with Ocular

Artifact: Independent Component Analysis is an amazing asset for wiping out a few significant kinds of non-cerebrum relics from EEG information. Eye advancements cause changes to the electric fields around the eyes, and accordingly over the scalp. As a

result, EEG chronicles are normally basically misshaped, and their understanding hazardous. Different procedures have been proposed to beat this issue, stretching out from the rejection of data contrasting temporarily with huge eye advancements, to the departure of the assessed effect of visual development from the EEG. Independent Component Analysis is a powerful tool for eliminating several important types of non-brain artefacts from EEG data and allows the user to reject many such artifacts in anefficient and user-friendly manner.

D.Feature Extraction and Classification

A versatile component extraction method Hilbert Transform was connected to separate pertinent highlights in time-recurrence area. It is the important way to deal with uncovers data covered up in the sign considering the non-stationary nature of the signal.The purpose of this stage is to map EEG into theconsequent stress state. An adaptive featureextraction technique Hilbert Transform wasapplied to extract relevant features in time frequency domain. It is the relevant approach tounearth information hidden in the signalconsidering the non-stationary nature of the signal.

The element vector got through Hilbert transform is arranged into impartial or three dimensions of pressure (stress-low, stress-medium and stress-high).Support Vector Machine (SVM) is used to classify the stress levels.

SVM: The objectives of SVM are isolating the information with hyper plane and stretch out this to non-direct limits utilizing bit trap.For computing the SVM, the objective is to effectively arrange every one of the information.

If Yi= +1;wxi +b>=1

If Yi= - 1; wxi + b $\leqslant$ 1

For all I; yi (wi + b) $\geqslant$ 1

In this condition x is a vector point and w is weight and is likewise a vector. So to isolate the information ought to dependably be more noteworthy than zero. Among all conceivable hyper planes, SVM chooses

the one where the separation of hyper plane is as huge as could be expected under the circumstances.

IV. RESULTS

The proposed system is implemented using Python.Dataset is imported. The stress analysis of a person usually depends on various factors ranging from their age, gender to their fatigue level, its really important to consider all these factors as they play a very important role in calculating the stress level of a person.

A.   Importing EEG Data set:
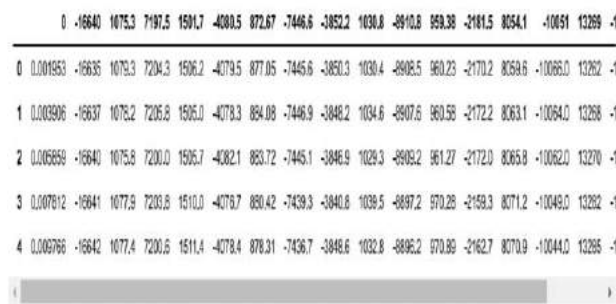
B. Extracted EEG data of different electrodes
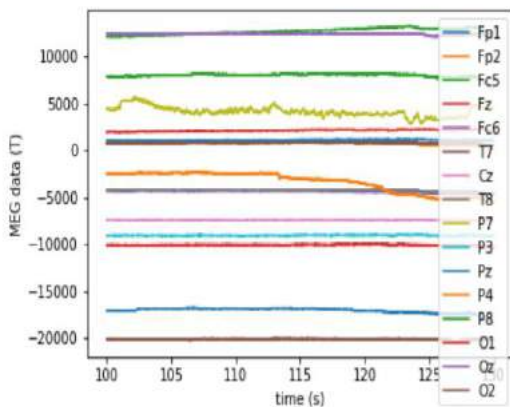
C. EEG data after applying ICA
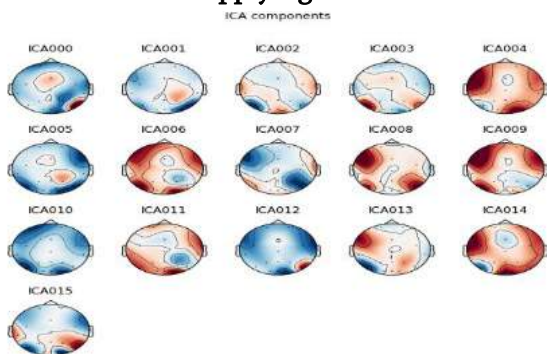
D. EEG signal after pre-processing
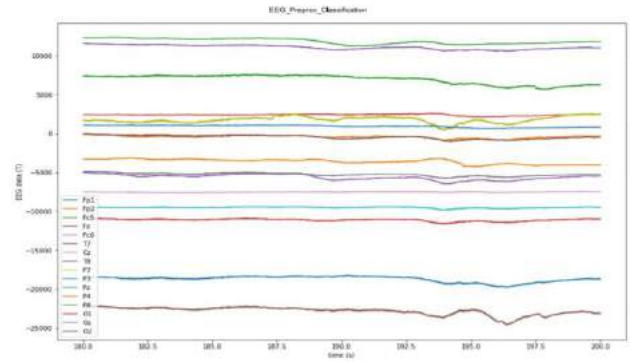
E. Final output
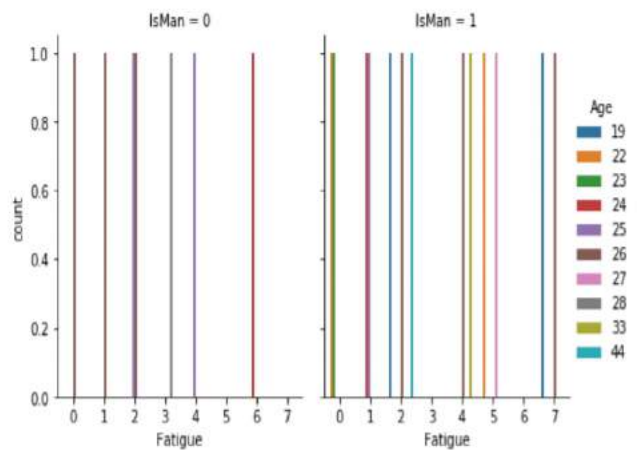
V. CONCLUSION

EEG signals gives betterfeature extraction results for stress classification compared to other signals. Theproposed framework improves accuracy of feature extraction and classification technique.

Further, the proposed framework will be helpful in such a way that it may lead to a new mode of medication to relieve a person's/ subjects stress level after appropriately interpreting EEG signals.So, this proposed system is an EEG-based stress analysiswhich captures the constant EEG signals and structures the complete loop by showing various qualities according to the electrical signals on the scalp. The useful information from the EEG signals and implemented SVM as classifier and obtained accuracy of 83.34%. The outcomes reported the feasibility of using EEG for stress analysis, which is significant for clinical intervention and avoidance of physical and psychological wellbeing issues.

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A Review on Data Science Approach Towards Decision-Making

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ABSTRACT

Data Science is a modern intellectual trans-discipline that intensified over long duration of exploration about assisting managerial decisions in companies. It is an essential and notable hypothesis. It is a newly boosting track that integrates diverse workouts, for example data mining and information investigation, machine learning. It handles different techniques extending from programming, processing, information building, data transformation, and design recognition. Examining the demand for data scientist uplifts instructors and executives to investigate concerns of decision-makers reasoning needs of data analysis, analytical tools, skill requirements and educational development. This review examines data science and data experts who make use of latest information streams and analytics to assist decision-making. It also gives a well-defined approach pertaining to data science technologies, applications, and preparing data scientists to be better decision-makers.

Keywords : Analytics, Data Science, Data Scientist, Decision Support System, Rationality, DSS Design, Data Science Tools, Data Prediction.

I. INTRODUCTION

Executives are dealing with two things confrontations and openings from latest developing information streams. Few examiners have named the developing streams 'big data', although others identify the occurrence more illustrative as expanding data sets, quicker, advanced acceleration information. Assisting decision-making, utilizing new data streams is a vital concern and a lot of digging in, brainstorming and examinations are required. Every decision support ability, along with appointing a skilled data scientist, must require an objective task. Data science is a critical subject. Facebook, Google, EMC, IBM and many other organizations have arranged business positions for data science enthusiasts. A search result in 2015 for the word 'jobs in data science' gave 57,900 outputs; 'data science' gave 9,650,000. This clearly demonstrates the expanding passion over time. Hal Varian, "The ability to take data- to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it- that's going to be a hugely important skill in the next decades. Because now we really do have essentially free and ubiquitous data. So the complimentary scarce factor is the ability to understand that data and extract value from it". This review examines data science and the enthusiasts named 'data scientists' who implement the latest information streams and hypothesis to assist decision-making and later

brainstorm the preparations needed to be a data scientist, applications of data science, tools required by the data scientists. In the coming sections of the paper, we would we looking into the new data streams followed by rationality and analysis, cultivating data scientists, the basic steps, and applications, and finally the tools for data science.

II. NEW DATA STREAMS

The expression 'big data' is vastly utilized and is a dazzling expression aimed at the latest data stream. The expression has a tiny substantial object, nevertheless, underestimates to some degree a critical transformation in data gathering, retrieval and storage. Many of us, in our everyday life contribute massive loads of digital data. This could be from our activities online, since devices gathering devices are documented and preserved in the cloud. Managers are looking at a noble value in the mixture of well-organized and information streams to direct tasks and contribute new, high cost services. Companies can collect, store and analyse data randomly to all of our individual work. Investigating this data is a confrontation and is vital, and the requirement has directed to the evolution of a new arena of training called data science. Data is piling up quickly than it can be examined. Not having well equipped staff, managers find it hard to deal with such gigantic load of data that are now piling up. Data expansion for all kinds of companies and communities in general is consistently growing. The growth rate for any particular organization relies upon many aspects including information culture of the company. Frontline companies are encountering intense growth in data. 'Data science' is a thrilling, intellectual, professional field. Also, numerous meetings are brainstorming data science, analytics and big data. Data must be investigated to convey decision-making. The right information is required to perform secure analysis. The right data is applicable, precise and appropriate. At large, there are three major types of analyses prepared by data scientists [power, 2013b, 2014] [13]. IT educators are

required to enhance data experts who portray the proficiencies of a database illustrator, statistician and incredible storytellers to investigate the new information streams for decision-relevant findings [cf Davenport & Patil, 2012] [3]

III. RATIONALITY AND ANALYSIS

Logical thinking and a passion for proof built decision-making looks critical to productive use of outputs obtained from the data and model-driven decision support system (DSS), but can we accept that the company managers and the staff who use this outputs are rational thinkers? If not, how can we in the right way assist their decision-making?

Decision support and analytics can significantly assist people in making rational choices that potentially lead to great outputs, but we need to be practical pertaining to the restrictions of our end users. Decision support experts must know if the end users want rational decisions. Rationality is a complicated perception that implies that the decision has been made based on its consistency, logic, and its criteria. Few other definitions support rationality as a state of god argumentation and analysis. These definitions go on to say that decision support and analytical examinations are intended to people who base their decisions on good judgment and logic.

Assisting decision-making is a complicated agenda and a lot of new system probably will need to be built to use new data streams. Robert Anthony (1965) classified decisions in four categories:
- Strategic Preparation
- Management Rule
- Operational Rule
- Operational Routine [Figure1]

Analytics using the latest data sources will perhaps be absorbed at everyday part of the organization pyramid on operative control and operating performance. For example, executives use analytics and new data origins to keep an eye on product quality, product need, service quality and service needs and monitor risk and as a part of operational activities executives make routine decisions in

functional units. The agenda of the analyses is to enlarge the logic and the swiftness of frequent and semi-structured decisions.
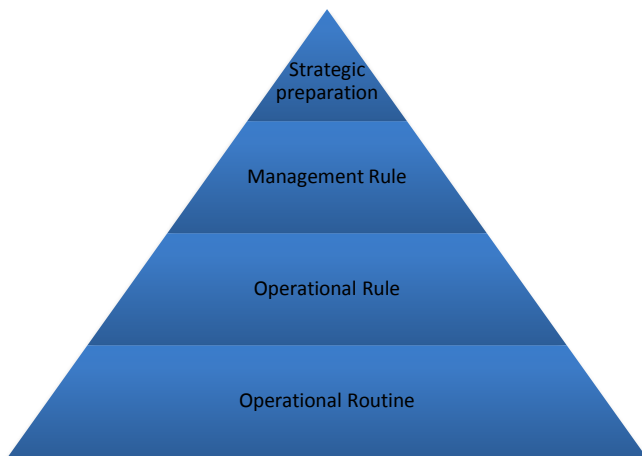
Figure 1 (From Power, 2002 p.38)

Nobel laureate used the phrase 'bounded rationality' to narrate special behavior that is strained through the restriction of data, understanding, managing time and intellectual power. Considering our aimed decision-makers are only logical in a restricted result sphere is further suitable. Creating that speculation of restricted wisdom should support in presenting meaningful analyses.

IV. CULTIVATING DATA SCIENTISTS

The main focus of a data scientist is associate with decision-makers in semi-structured positions. Executives are looking to use the latest information streams. Executives are seeking the support of a data expert in decision-making.

The idea of a data expert has been produced by universities and technologists. Davenport and Patil (2012) reasons: "Data scientists help decision-makers shift from ad hoc analysis to an ongoing conversation with data".

In an outstanding outline blog post at O'Reily Radar, Mike Lourides (2010), vice president of the content strategy for O'Reily Media lnc, directed the enquiry "what is data science"? Data science is the root to describing the job of a data scientist. Lourides investigated the skills, the firms and the ability connected through the data science. He stated that

"data science enables the creation of the data products" also, he recognized that data science performed in businesses is considered to build significance, having to do with job, Lourides (2010) describes "data scientists are involved with gathering data, messaging it into a tractable for, making it tell its story, presenting that story to others"[8]. IBM (2014) [7] answer's the enquiry "what is a data scientist?" A data scientist expresses advancement in computer science and purposes, modelling, facts, analytics. What distinguishes the data scientists is powerful industry awareness combined with the potential to convey results to industry and Information technology managers in a method that can effect how a company faces a industry issue. Potential data scientists will not just report the issues; they will select the appropriate issues that have the greatest worth to the company. Data science is not the knowledge of data ; moderately the expression indicates to attempt to produce a extra knowledgeable investigation of information. The growing complexity of large data sets needs enlarged capabilities in numerical analysis, hypothesis generation, information recovery and report writing.

V. BASIC DATA SCIENCE STEPS

Data wrangling: Gathering data from a significant regions and the procedure of physically transforming information from one "raw" arrangement into a different arrangement that permits for extra suitable utilization and operations of the information by the means of semi-automated tools is called as data wrangling.

Data Analysis: Analysis or examination of data is a method of shifting, processing, displaying data with the aim of discovering useful insights, supporting decision-making with the help of various machine learning algorithms and statistical knowledge we can extract useful and meaningful insights from great sizes of data.

Deliver Data: Conveying data consists techniques to modify the statistical or mathematical outputs driven from the information into a form which can be effortlessly agreed by the community. Delivering data is allowing the improvement beginning with one viewpoint then onto the next, improving a fresher to turn into an professional.

VI. APPLICATIONS OF DATA SCIENCE

Business Analytics: Gathering information concerning historical and present accomplishments of an industry can offer insights into the performance of the industry and assist in decision-making process and construct analytical models to predict upcoming presentation.
[Image source: Google Images]

Prediction: Huge volumes of information gathered and examined can be used to discover designs in information, which could be great help in building predictive models. Machine learning methods are widely used to shape analytical representations in various areas.
[Image source: Google Images]

Safekeeping: Information gathered from operator records are used to identify deception by making use of information science. Designs identified in operator action can be used to separate bags of mischievous insiders. Data mining and machine learning are used by financial companies and banks to prevent fraud activities.
[Image source: Google Images]

Bio informatics: Bio Informatics is an improving field where PCs and information are used to recognize biological information such as genetics and genomics. "Next-generation genomic technologies allow data scientists to drastically increase the amount of genomic data collected on large study populations. When combined with new informatics approaches that integrate many kinds of data with genomic data in disease research, we will better understand the genetic bases of drug response and diseases".
[Image source: Google Images]
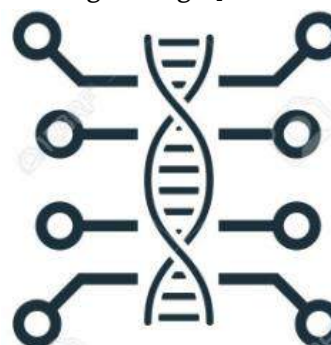
Science and Exploration: Astronomical information after millions of instruments and their information has to be investigated to bring out useful outputs. Planetary information from modern-telescope and climatic information by NASA are few instances of information science being used.
[Image source: Google Images]
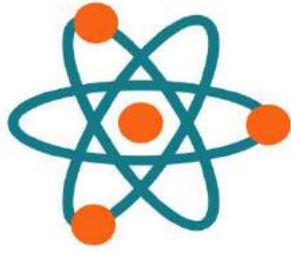
Governance: Information science is used in government sector to avoid deception, combat cyber attack and protect sensitive information, improve defence systems, make use of the information to make better financial decisions.

[Image source: Google Images]

VII. TOOLS FOR DATA SCIENCE

R- PROGRAMMING

R is a programming tool with the extreme aim of significant counts and data investigation. R-tool is used mostly by the data investigators on a giant extent of graphic withdrawal. R's significance has prolonged immensely starting late, which was demonstrated by the investigators. R was designated after the leading names of the R producers. R is obtainable under the GNU General public license. R provides non-identical measurable techniques from presenting to investigating, assembling, directing and many more. The enthusiasts who are well known in C, C++, Java, Python can design their own code to monitor the objects in R. R creates flexible, awareness and generating high standard summary for data investigation.

PYTHON

Python is proficient, flexible, open-source coding language which is uncomplicated, easy to implement and has fruitful archives for information regulator and investigations. Its framework is very simple and is accessible to the programing non-specialists. For the past 10 years, Python has been made used for legitimate frameworks to boost space shuttle mission configurations, to operate on pictures from Hubble space telescope, material science tests. As proved by the TIOBE index, Python is highly emerging amongst the well-known Coding languages on earth.

HADOOP

Hadoop is an open-source coding design for desirable bulk of datasets. It goes to an extent it indicates one can drag data here and there without stressing about it. Hadoop generously offers gigantic lengths of sustainability for any kind of data.

Data Visualization tools:

Data visualization is a strengthening branch of calculations. It involves modelling and investigation of digital illustration of the data in a representational setting. Few of the tools are as follows:

TABLEAU:

This software is robust and swift evolving visualization tool. The info-graphics made by this tool are in the form of dashboards and worksheets. Tableau supports in unscrambling raw data into user-friendly format. It can be grasped by any individual at any level in a firm. The best features of Tableau are:

- Real time analysis
- Gathering of data
- Merging data.

D3: One can use D3 because it offers a possibility to build, assemble the data representation system one desires. Data Portrayal are fixed on a lot of options to create the system to easy to use.

Data Wrapper:

Data wrapper empowers one to create outlines and maps. This utensil reduces the amount of time spent in creating illustrations from hours to minute. Data wrapper functions for personalizing an individual needs.

VIII. CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion these should be referenced in the body of the paper.

Computer Aided Diagnostic Techniques in Automated Detection of Eye Related Diseases - A Comparative Study

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ABSTRACT

World Health Organization (WHO) in a new study has recognized eye related defects to be one of the primary health challenges faced by the existing society. Common retinal abnormalities include Glaucoma, Diabetic retinopathy and Macular degeneration. Retinal eye defects have significantly increased in the last decade across developing and developed countries. These defects if not diagnosed and treated at the appropriate time, would result in complete loss of vision. Diabetic retinopathy is predominantly common among diabetic patients. In Macular Degeneration, the central part of the retina is widely affected. In this case, the retinal cells deteriorate and images are not established correctly. The CAD system for eye diseases falls under the Supervised Learning techniques. This technique refers to methods that enable creation of a correlation with different features and labelled outcomes. Few of these include KNN, Naïve Bayes, Adaboost Classifiers, tree-based Classifier, ELM classifier, SVM and LIBSVM classifier etc. The main objective of this paper is to summarize the various CAD techniques adopted for early detection of eye diseases.

Keywords : Retinal abnormalities, Glaucoma, Diabetic retinopathy, Fundus images, Feature detection, Segmentation, Optic disc, Optic cup, KNN, Naïve -bayes, SVM.

I. INTRODUCTION

WHO has highlighted in a recent study that 285 million people with visual impairments either in the form of blindness or visual impairment. This amounts to 10% of the total world population. This stresses the need for cost effective, faster techniques to identify such deficiencies and address them at an early phase. [4] Retinal abnormalities are currently common critical issues faced by people across different strata of the society. Common retinal abnormalities include Glaucoma, Diabetic retinopathy and Macular degeneration. These defects if not diagnosed and treated at the appropriate time, would result in complete loss of vision. Many of the most recent treatments for these ailments include reduction in progression of the defect rather than a complete cure of the abnormality. In many cases, it is noticed that these defects go unnoticed as they are symptom free and substantial loss of vision occurs even before the actual diagnosis.

Retina is a critical part of the eye enabling conversion of light to neural signals to enable the brain for visual recognition. Retina requires sufficient and constant supply of blood through network of tiny blood vessels for proper functioning

[8]. Diabetic retinopathy is predominantly common among diabetic patients. As the blood sugar level increases, the blood vessels in the retina are damaged. The blood vessels swell, leak or close eventually stopping the flow of blood to the retina.

Macular Degeneration is the deterioration of the central portion of the retina. In this case, the retinal cells deteriorate and images are not received correctly. Glaucoma is a chronic visual impairment which leads to loss in vision. It is generally characterized by degeneration of optic nerves. The general perception is that glaucoma is caused by increased pressure in the eye. The elevated pressure is caused by the impaired drainage of fluid (aqueous humor) in the eye. The normal eye pressure is between 14mm Hg and 20mm Hg.[12]

Most of these defects are gradual and hence identification of defects at an early stage becomes a significant challenge. While vision damage cannot be cured, the progression of these abnormalities can be slowed down with medication. With the growth of population and reduction in doctor to patient ratio, it is necessary to develop cost effective automated methodologies that enable faster / earlier diagnosis. Recent advancements in the field of Image Processing and Data Science have helped automated diagnosis of many eye related defects.

Image processing is the transformation of an image, which is a 2-dimemtional signal, f(x,y) (where x and y represent the amplitude and intensity of the image) through data processing. For processing, the image is converted to digital form using sampling and quantization. The different steps in image processing are, image acquisition, enhancement, segmentation, feature extraction and pattern recognition. An extension of the application of image processing in the field of medical sciences is called medical image processing. This involves use of image processing techniques to create visual representations of the interior of a body for clinical analysis.[19] The use of medical image processing to assist doctors in diagnosis of diseases is called Computer Aided Diagnosis.

The main objective of this paper is to summarize the various CAD techniques adopted for early detection of eye diseases. Different feature selections that have been used and classification techniques for identification of the retinal disorders are discussed.

II. METHODOLOGY

The CAD System for Glaucoma diagnosis:

The general methodology followed in the computer aided diagnosis of glaucoma follows traditional machine learning techniques following a predefined standard set of steps [23]. A summary of the steps involved are as follows

a)   Preprocessing: Fundus images are of high resolution and normally captured under various varied lighting conditions and hence requires enhancement and standardization preceding feature extraction. Fundus images captured are by a high-resolution fundus camera and these images consume significant time and hardware resource requirements. Pre-processing is done to the fundus images using methods like CLAHE in order to remove the non-uniformity.

b)   Segmentation: The segmentation of the region-of-interest (ROI) from the fundus images will be performed prior to feature ex- traction. The segmentation of the ROI process involves localizing the OD and then extracting features from the segmented OD. RNFL and PPA are detected and measured using filtering methods (Gabor), textual analysis and transformation (polar). This is generally semi-automated in the overall process of detection.

c)   Feature extraction: This process involves using images of the fundus to identify distinguishable features. Cup to Disc is the fraction of optical cup to optical disc dimensions. In this step identification of the optic disc and characterization is performed. From the original image the identified region is extracted for segmentation. The optic disc detection involve localization followed by segmentation

d)   The discrete wavelet transforms (DWT), empirical wavelet transforms (EWT) and variational mode decomposition (VMD) are used during feature

extraction. Both DWT and EWT utilize low and high pass filters to decompose the images into coefficients. Then, these coefficients are subjected to further analysis. The VMD decomposes the images into different amplitude- and frequency-modulated coefficients. These transformation techniques decompose the images to obtain coefficients that are useful in differentiating the two classes of optic discs (normal and glaucoma). On the other hand, the GIST descriptor which is a form of image descriptor that describes the visual features of the fundus images based upon various orientations and scales of the images, is also used for glaucoma detection.
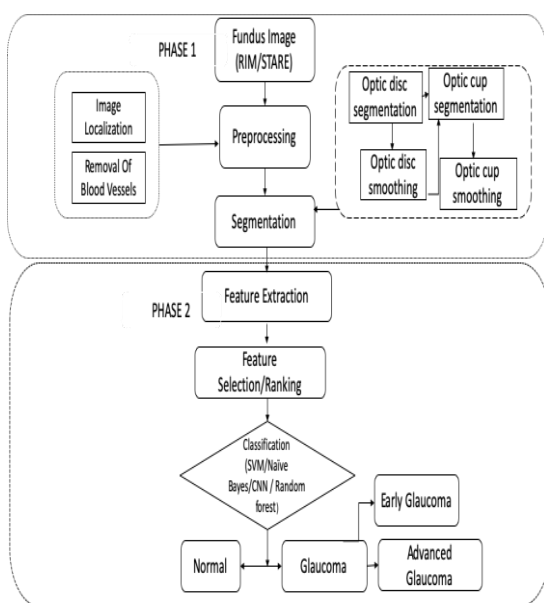
Figure 1. Proposed CAD System

III. LITERATURE REVIEW

Most of the research around CAD for eye diseases are based on tree / linear / probability based. The application and the accuracy of the different approaches are discussed below

Priya et. al [12], used dataset from Dr. Sudhakar, Nagpur. The dataset comprises of 50 images taken from an age group ranging from 20 – 70 Years. Preprocessing was done using histogram equalization and radon transformation. Radon transform is used for feature detection. Two features namely, Higher Order Spectra and texture descriptors are extracted using Radon transform. Different classifiers were used for the classification of the images. The

classifiers used were random forest and Naïve Bayes classifiers. The classifier was chosen based on the effectiveness in capturing discriminative properties. Lack of normalization can skew the classification results. Z-Score normalization and min-max normalization were used to normalize the features. The classification accuracy obtained was ~91%.

Jyothika et. al [8]., in the classification approach, have preprocessed using anisotropic diffusion filter for noise removal, OTSU thresholding, canny edge map and image inpainting for extraction of retinal blood vessels. Optic cup and Optic disc boundary detection by K-Means clustering, Multi-thresholding, Active contour method and Fuzzy C-Means clustering were used. Finally, ellipse fitting is used for smoothing of the boundaries. Classification is done using SVM and Back propagation networks. Model accuracy was evaluated on a dataset of 20 images from Vitreo Retina Unit, AIIMS, Delhi

Iyyappan et. al [6]. uses 2D discrete wavelet transform (DWT) for feature extraction and classification using neural networks. The images for the training and validation were captured using fundus camera. Discrete wavelet transforms (DWT) based feature extraction is done using Daubechies (db3), symlets (sym3) and biorthogonal (bio3.3) which are basically three wavelet fillers. Wavelet decomposition is done by capturing both spatial and frequency information of the signals. Image is passed through high pass filter and low pass filter. Classification is done using probabilistic neural network (PNN).

In Darsana et. al. [7], feature extraction is performed using color model analysis, morphological processing, filtering and thresholding. Mask generation and feature segmentation is based on array centroid method used for rim to disc calculation ratio. In this paper classification is done using SVM.Here during preprocessing, the best channel based on hue, saturation and value is selected for optic cup and disc segmentation and vessel extraction. Blood vessels are removed using morphological closing in value channel image. Median filtering is done to remove noise and

preserve the edges. After filtering, thresholding is done using manually selected threshold value. Segmentation of optic cup and optic disc and rim is done. Top hat filtering is done using square structuring element. Array centroid method for segmentation has centroid calculation, array initialization, mask image generation and mask feature image multiplication. CDR is computed and classification is done using SVM. The dataset used comprises of 30 images are classified as low, moderate and high-risk Glaucoma.

Sri Abirami[3] et. al. proposes a fuzzy min-max neutral network based on Data (DCFMN). DCFMN has two classes of neurons, classifying neurons and overlapping neurons. In preprocessing color conversion, resizing and pruning is done. Segmentation is done using thresholding techniques. Angle detection is done by DCFMN for previously segmented images. DCFMN architecture has three layers. These layers comprise of input, middle and output layer. Classification is done using fuzzy min-max neural network algorithm.

Laszlo et al [9], proposes a novel classification method in which in the first step which is preprocessing in which illumination correction, removal of blood vessel and the normalization of the papilla is done. In the next stage which is the feature extraction, the pixel intensity values, FFT coefficients and the B-Spine coefficients are considered. The classification is carried out by a two-stage classifier in which in the first stage, compression of PCA compressed feature type classification is performed separately and in the second stage, concatenation is applied to a two-dimensional common feature space.

Muthu Ramakrishnan et. al[13], proposes a methodology for the diagnosis of macular degeneration. The methodology is organized as image acquisition, preprocessing, feature extraction, ranking and selection. Contrast enhancement is done by CLAHE (Contrast Limited Adaptive Histogram Equalization) dimension. Features like Fractal dimension (FD), Graber wavelet entropies and HOS features are extracted from preprocessed fundus

images. AMD classification is done by SVM, DT, DNN, KNN and Naïve Bayes classifier. ARIA and STARE datasets are used. AMD progression detected by presence of drusen pigmentary irregularities and new vessel proliferation.

Bo Wu et. al.[1], proposes a novel method to diagnose diabetic retinopathy. The four major steps are preprocessing, candidate extraction, feature extraction and classification. 27 Local and profile features referred to as characteristic features are extracted for classification using KNN classifier. In diabetic retinopathy, detection of microaneurysms which are important lesions that are small and round in shape near tiny blood vessels in fundus images. In preprocessing, illumination equalization is done using CLAHE to reduce noise and enhancement. Smoothing is done using Gaussian filter which is followed by candidate extraction. Using peak detection, the presence of peak is detected as identified as the center of the profile and the surrounding region is marked as the growing region.

Amin [2] paper deals with automatic classification in exudate and non-exudate region in retinal image. Preprocessing of candidate lesion extraction, feature extraction and classification is done. The Gabor filter is used in grayscale image for lesion enhancement. Segmentation is done based on math modal morphology. The feature set selection is done be combing mathematical and geometrical features. KNN and tree-based classifier are used for classification.

Harry Pratt & et al [14], uses convolutional neural network for diagnosis of diabetic retinopathy. Data augmentation with convolutional neural network architecture is used to identify intricate features like micro aneurysms, exudates and hemorrhages on the retina. Then automatic diagnosis is done without user input. The Kaggle data set was used for this purpose with an accuracy of 75% and sensitivity of 95%.

Maheshwari & et al [10], discusses automated diagnosis using digital fundus images based on empirical wavelet transform. EWT is used to decompose images and corentrophy features

obtained from decomposed EWT component. The features are extracted and ranked using T-Value feature selection algorithm. The classification of glaucoma is done using least square SVM.

Bock et al [22], has devised a database driven system for the computerized detection of eye diseases called Cat Eye where processing, analysis and classification of retinal images is done. Homophobic surface fitting is used for the correction of non-uniform illumination. A process called morphological in painting for the removal of blood vessels in the eye. In this method features like 28 Gabor features, coefficients of Fast Fourier Transform and the pixel intensity values are extracted using four methods. Histogram play a role in providing a summary of the distribution of intensity. The classification process is done by a two stage SVM classifier.

IV. CLASSIFICATION ACCURACY

The feature extraction procedures and classification algorithms discussed above have been used across different retinal abnormalities. The following table summarizes the accuracy attained as reported by the different authors.

Author	Application	Classifiers and Accuracy	Application
Muthu Rama Krishnan Mookiah	2014	SVM-90.19%	Macular Degeneration.
Mardin Christian	2003	Tree Classifier-77%	Glaucoma
Carson Lam & et al.	2017	Random Forest Classifier-77%	Diabetic Retinopathy
Muthu Ramakrishnan	2013	SVM-91.67%	Glaucoma
Rajendra Acharya & et al.	2011	Random Forest Classifier-91%.	Glaucoma
Jyotika Pruthi & et al	2013	BackProbagation-97.3%	Glaucoma
Abirami & et al	2013	Linear Classifier Neural Network97%	Glaucoma
Anusorn & et al	2013	Tree based Classifier-89%	Glaucoma
K. Narasimhan	2011	SVM-95%	Glaucoma
Priya Khumbare	2014	Random Forest -91%	Glaucoma
Darsana S & et al	2014	SVM-95.7%	Glaucoma
Iyyanarrappan & et al		SVM-95%	Glaucoma
Bock & et al	2007	Neural Networks-86%	Glaucoma
Wong Li Yun & et al	2017	Neural Networks-90%	Diabetic Retinopathy
Hatanaka & et al.	2010	Tree Based Classifier-80%	Glaucoma
L'Aszl & et al	2009	SVM-86%	Glaucoma
Harry Pratt et.at.	2016	SVM - 75%	Diabetic Retinopathy

V. OBSERVATIONS

It has been observed from the following research papers that lots of methods using different features and classifiers have been used in automated diagnosis of retinal diseases and with the training sets and testing sets from databases like ORIGA, DIARETDB1, DRIVE, STARE the researchers have been able to obtain a detection accuracy of around 97% for a limited set of data.

VI. CONCLUSION

In the last decade significant amount of research had gone through in detection of eye related diseases using computational methods. Many of the methods attempted includes classification by classifiers like SVM, Random Forest, Guassian method etc. in conjunction with different feature selection methods. These methods have reached an entitlement in terms of detection accuracy. The next level of improvement can be attempted through methods like convolutional neural network.

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A Review of Security Strategies used in Vehicular Adhoc Networks

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ABSTRACT

This is a review of various aspects of security strategies used for Vehicular Adhoc Networks. In this paper we will be exploring the different threats to system security seen in a Vehicular Adhoc Network Subsystem and their corresponding solutions. Vehicular adhoc networks comprises methods by which Vehicles can communicate with each other either in an independent or adhoc manner or through a designated third-party intermediate node referred to as "Road Side Unit". Given the domain, the connection between the devices is wireless. The security challenges in Vehicular Adhoc Networks are similar to those associated with Wireless Technologies and Distributed Computing. In this document we shall be looking into cases regarding Certificate based authentication and usage of basic PKI Infrastructure, Sybil attacks, Invalid Certificate Revocation Methods, Black Hole attacks, Gray Hole Attacks, Worm Hole Attacks, Jelly Fish Attack and Spoofing. We shall also be looking into Adhoc Routing Protocols like Adhoc On Demand Distance Vector Routing protocol (AODV) and methods to prevent Black Hole and related attacks.

Keywords : VANET, Network Security, Vehicular Edge computing, Intelligent Transport Systems (ITS), Public Key Infrastructure, Sybil attack. Black Hole Attack, Worm Hole Attack, Jelly Fish Attack, Gray Hole Attack, AODV

Usage of Electronics Information Resources by Selected Government Medical College Library Faculties and Post Graduate Students Affiliated To Rajiv Gandhi University Health Science Karnataka : A Case Study

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ABSTRACT

The paper focuses on the use of electronic information resources by the faculty members and P.G. Students of selected medical college libraries in Hyderabad-Karnataka region. The investigator has distributed questionnaires to the faculty members (90) and P.G. Students (90) total 180, out of which faculty members (75), P.G students (75) total 150 (83.33%) questionnaires were received back. The findings of the study shows that majority (85%) of the respondents purpose of accessing internet for data communication (sending and receiving E-Mail, Chat, Net Phone) followed by 51% of them access internet for purpose retrieve medical case history. The result also indicates that majority (88%) of the respondents use electronic information resources for supporting teaching activities and 61% for journal club purpose. Some of the considerable numbers of respondents (85%) are aware of electronic information resources by personal communication with friends, subject experts and resource persons.

Keywords : Internet Electronic Information Resources, Medical College libraries, Hyderabad- Karnataka, India, HELINET

I. INTRODUCTION

Electronic information resources (EIRs) are becoming top worldwide, and these are very much evident right from the day of existence of libraries, that libraries are providing abundant and varied information on deferent areas and deferent subject of fields to one and all the users who visit it. Health practitioners need information searching skills to deal with the growing volume of medical science (Sharanabasappa 2019). Therefore, the ability to quickly access, follow, coordinate, analyze and store

information is essential for routine decision making related to patient care, education and research. In addition to the latest changes in the health care systems developed countries have placed new demands on health care services. Delivery of healthcare has become interwoven with the adoption of Computer and EIRs for updating their academic and research knowledge.

The study is confined to three old private medical college libraries in Hyderabad-Karnataka namely 1. Mahadevappa Rampure Medical College, Gulbarga 2.

Khaja Bandanawaz Institute of Medical Sciences, Gulbarga 3. Navodaya Medical College, Raichur.

About Hyderabad-Karnataka

Details of Hyderabad-Karnataka region, which is the region selected for the present study is as follows. H.K. (Hyderabad-Karnataka) region is the name given to the area which was the part of erstwhile Hyderabad Province before the formation of new state. When the new sate of Mysore (Presently known as Karnataka) was formed in 1956 (Wikipedia, 2019), Kannada speaking areas of Hyderabad Province were added to the new state. These areas came to be known as H.K Region later on. At present, the H.K region includes six districts namely, Bidar, Kalaburagi, Yadagir, Raichur, Koppal and Bellary (Govt. of Karnataka, 2019).

II. PROFILE OF THE SELECTED MEDICAL COLLEGES

Mahadevappa Rampure Medical College (MRMC)

M.R. Medical College was decided to establish by the Government of Karnataka at Bellary instead of Gulabarga, Hyderabad-Karnataka Education Society under the leadership of founder of Sri Mahadevappa Rampure started Medical College in private sector at 1963 (HKES, 2019). At the time Govt. of Karnataka Chief Minister Sri. S. Nijalingappa, and Sri. Veerendra Patil and Dr. D.C. Pavate helped in establishing the M.R Medical College. The college was affiliated to the Gulbraga University till the year 1996 and after that it got affiliated to Rajiv Gandhi University of Health Sciences, Bangalore. Its Library and information center has 4,800 sq ft. of floor area, it is located at the 3rd floor, with the provision for textbooks section, reference section, stock area, back volume area, periodical section, dissertation section, audio/video section, reprographic section, computer work station with internet with Wi-Fi facility and access to electronic resources.

Khaja Banadanawaz Institute of Medical Sciences (KBNIMS)

The Khaja Education Society was established in the year of 1958, by its founder Janab Syed Shah Muhammad Al Hussaini. Today Khaja Education Society has more than 15 institutions running under its umbrella. In that KBNIMS is a Minority Institution which was started in 2000, permission given by Govt. of India, approved by Medical Council of India (KBNIMS, 2019). The KBNIMS is affiliated to Rajiv Gandhi University of Health Sciences, Bangalore. KBNIMS Library and information center have separate independent library building, providing all services, facilities, fully campus Wi-Fi facility and easy access to electronic information resources.

Navodaya Medical College (NMC)

Navodaya Medical College was started as a first private sector medical college in Raichur, The founder is S.R Reddy, the college started with only the Navodaya Hospital & diagnostic center in 1996. Later in 2001 with setting up of NMC it became the full-fledged independent Medical College, affiliated to Rajiv Gandhi University of Health Sciences (NAVODAYA 2019). NMC Library and information center is well established, Library building is strikingly an architectural beauty, with its massive structures and aesthetic view leaves every one spell bound. The library area is around 4200 Sq ft. of floor area spread over in two floors with provision of different sections, digital library, conference room and NMC has full Wi-Fi facility for the access of the e- resources.

III. REVIEW OF LITERATURE

Jotwani (2014) studied the trends in acquisition of e-Resources vis-a-vis their print counterparts, identifies the e-Resources being subscribed by seven Indian Institutes of Technology (IITs) libraries located in India, and analyzed the usage of these resources during 2004-11. There is a clear shift in the

collection development policies of these libraries where e-Resources have become a vital part of their core collections. E- resources in all IITs are being heavily used as the number of downloads have increased from 3233818 to 7617691 articles reflecting a growth of 135% over a period of 8 years.

Issac and others (2015) conducted analytical study on use of Blogs among Library and Information Science (LIS) professionals in University of Calicut. A blog is an Internet or web service that helps to give awareness about the information of any topic of study of any interest. Blog is a website usually maintained by an individual with regular entries of commentary, description of event or other materials. The main objective of study are assessing the extent of use of blogs among the LIS professionals. The study revealed that the more than half (51.11%) of the professionals' purpose of blogging is to share information or insight but, few use it to enhance their professional development. A majority (73.33%) of library professionals are getting information regarding their profession through blogging. A majority (62.2%) of library professionals agree that library blog is a good sphere and a good medium for forming new working relationships with library patrons and users.

Karkun and Kumbar (2015) carried out a survey of faculty members and research scholars on use and user perception of e-Journals and databases in Universities of Karnataka. The main objectives of the study are to find out the source of awareness of e-Journals and databases available at the university library, to know the availability and usage of e-Journals and databases in university libraries of Karnataka and to know the purpose and frequency of use of e-Journals and databases by the faculty and research scholars. The study covers faculty and research scholars of six Universities in Karnataka namely, University of Mysore, Karnatak University, Bangalore University, Gulbarga University, Mangalore University, and Kuvempu University, Shivamoga. The questionnaire method was used for the study to collect the necessary primary data, keeping in view the objectives of the study. Findings and Suggestions are: 994 (96.88%) members of faculty and research scholars opine as they are aware about e-journals v and databases made available via university library. 557 (56.04%) members of faculty and research scholars become aware of e-journals and databases while browsing Internet and 535 (53.82%) become aware of e-Journals and databases by colleagues. The speed of the Internet should be increased to speed up information search and retrieval v process. The web designers/ publishers/ distributors should provide online help menu in the search page for better utilization of their information products like e- Journals and databases.

Dunn, Marshall, Wells & Backus (2017) has discussed in their survey on 'examining the role of MEDLINE as a patient care information resource: an analysis of data from the Value of Libraries study'. The objective of the study was analyzed data from a study on the value of libraries to understand the specific role that the MEDLINE database plays in relation to other information resources that are available to health (medical) care providers and its role in positively impacting patient care. The methodology of study on the use of health (medical) information resources for patient care obtained 16,122 respondents from health care providers from 56 hospitals about how providers make decisions affecting patient care and the role of information resources in that process. Users indicated resources used in answering a specific clinical question from a list of Nineteen possible resources, including MEDLINE. The study data were examined using descriptive statistics and regression analysis to determine the number of information resources used and how they was used in combination with one another. Has discussed in their survey on 'examining the role of MEDLINE as a patient care information resource: an analysis of data from the Value of Libraries study'.

Kumar and Naik (2015) in this article 'Usage of Wi-Fi Service among Users of Bangalore Medical College and Research Institute (BMCRI) Library, Bangalore' by 47 students of the BMCRI. Survey method was used for the study. It was found that 68.08% students visit the library for reading textbooks. 87.23% students were aware about the Xerox service, while 65.95% students use the internet for educational purpose.51.06% students face the problem while using the OPAC and 61.7% ask for help to the Librarian in using the library.25.53% students rated reading area as very well. Students need more proper orientation in the use of library resources.

IV. OBJECTIVE

The main objective of this study is to investigate the use of electronic information resources by faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka region. The specific objectives are:

· To find out the purpose of accessing the internet and electronic information resources among faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka region.

· To know the level of awareness of electronic information resources among faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka region.

· To find out the usage of HELINET Consortia by faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka region.

· To know the frequently used search engines by faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka regions.

· To find out preferred format for downloading articles from the e-services among faculty members and PG students of selected Medical College Libraries in Hyderabad-Karnataka regions.

· To access level of satisfaction with electronic information resources by faculty members and PG

students of selected Medical College Libraries in Hyderabad-Karnataka regions.

V. METHODOLOGY

Keeping in view the objectives of this study, the survey method is carried out to determine and analyze the present study. The population consists of faculty members and P.G. Students. The study is confined to three old private medical college libraries in Hyderabad-Karnataka. For collecting the data, structured questionnaire comprised open and closed ended questions of the study. A total of 180 questionnaires were randomly distributed to selected medical college library users and 150 duly filled in questionnaires were received, thus, resulting into a response rate of 83.33%. The method has been analyzed and interpreted and presented using simple MS Excel sheet and generated tables.

VI. DATA ANALYSIS AND DISCUSSIONS

Table-1: Distribution of Questionnaire for Academic Status (N=150)

Respondents	Respondents	Percentage
Faculty	75	50%
P.G. Students	75	50%
Total	150	100%

Figure-1 Distribution of Questionnaire for Academic Status
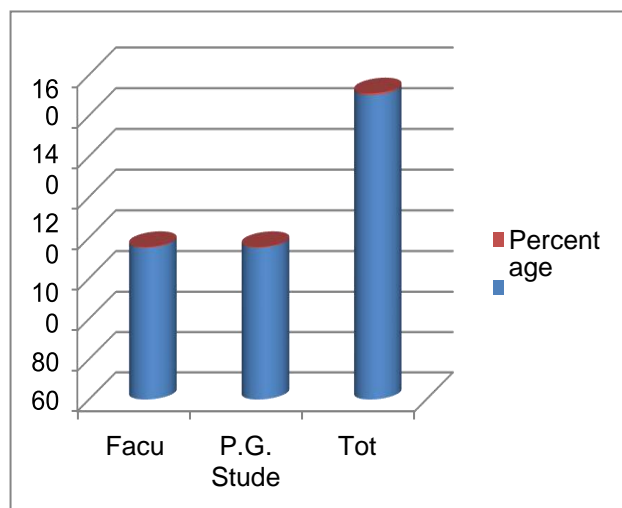
Table 1 Shows the distribution of respondents in the study. 50% percent of the respondents are Faculty members. Followed by 50% of the respondents are the P.G Students. It could be seen clearly from the above discussion.

Table-2: Purpose of Accessing the Internet

Sr.	Purpose	Respondents	Percentage
1	For data communication (sending and receiving E-Mail, Chat, Net Phone) etc.	128	85%
2	Search for academic medical information.	101	67%
3	For reading/writing research papers, research proposals and project work.	92	61%
4	For accessing E-Resources.	87	58%
5	For using online data bases e.g. PubMed.	84	56%
6	For accessing audio visual materials.	70	47%
7	For using course assignment.	52	34%
8	Medical case history	77	51%

Figure-2 Purpose of Accessing the Internet
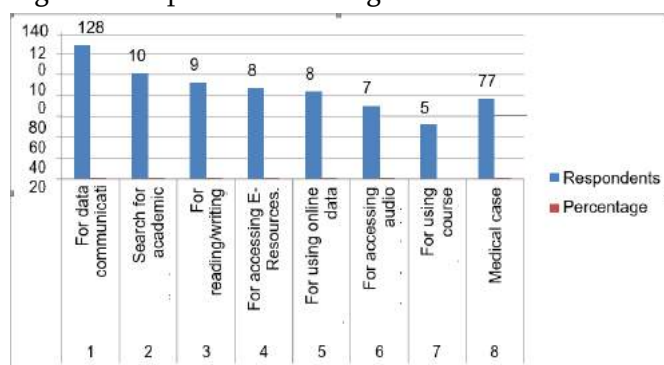
Table 2 reveals that majority of 85% of the respondents are use the internet for data communication followed by search for academic medical information 67%, for accessing e-Resources 58%, for reading and writing research papers, research proposals and project work 61% and for Medical case history 51%. Very less number of respondents 34% use internet for using course assignment. Therefore, it is clear that majority of the respondents use internet for data communication.

Table-3: Use of Electronic Information Resources

Sr.	Purpose	Respondents	Percentage
1	Supporting teaching activities	124	83%
2	Clinical practice	117	78%
3	Journal club	92	61%
4	Preparing for lecture	84	56%
5	Writing paper	80	53%
6	Undertaking research	105	70%
7	Carry out projects	88	59%

It is evident from table 3 that 83% of the users use electronic information resources for supporting teaching activities, 78% percent to clinical practice, 70% percent for undertaking research, 61% respondents for journal club and 53% percent of them use electronic information resources for writing their paper.

Table-4: Awareness of Electronic Information Resources.

Sr.	Awareness Factor	Respondents	Percentage
1	By personal communication with friends, subject experts and resource persons	127	85%
2	Through the librarian	83	55%
3	Announcements of journals	67	45%
4	E-mail alerts form publishers/distributors etc.	61	41%
5	Library web page	67	45%
6	Friends/Teachers	98	65%
7	Search engines	99	66%

Table 4 reveals that majority 85% respondents are aware of electronic information service through personal communication with their friends, subject exports and resource persons, followed by 66% by search engines, 65% got awareness by friends/teachers and 41% by E-mail alerts form publishers/distributors etc.

Table-5: Level of awareness of Electronics Information Resources.

Sl No	Electronic Information Resources	Not at all aware	Very little aware	To somewhat extent aware	Much aware	Very much aware
1	E-journals	2 (1%)	27 (18%)	72 (48%)	42 (28%)	7 (7%)
2	E-books	-	24 (16%)	79 (53%)	37 (25%)	10 (7%)
3	Databases	13 (9%)	17 (11%)	80 (53%)	35 (23%)	5 (3%)
4	PubMed	10 (7%)	19 (13%)	78 (52%)	35 (23%)	8 (5%)
5	Med Scope	16 (11%)	19 (13%)	68 (45%)	40 (27%)	7 (5%)
6	MEDLINE	11 (7%)	38 (25%)	61 (41%)	33 (22%)	7 (5%)
7	Science Direct	21 (14%)	37 (25%)	54 (36%)	28 (19%)	10 (7%)
8	AccessMedicine	17 (11%)	58 (39%)	38 (25%)	30 (20%)	7 (5%)
9	ProQuest	12 (8%)	56 (37%)	33 (22%)	35 (23%)	14 (9%)
10	Ovid	14 (9%)	56 (37%)	50 (33%)	15 (10%)	15 (10%)
11	Clinical Key	13 (9%)	42 (28%)	45 (30%)	33 (22%)	17 (11%)
12	Wiley online library	17 (11%)	26 (17%)	84 (56%)	15 (10%)	8 (5%)
13	Oxford University Press	26 (17%)	24 (16%)	81 (54%)	11 (7%)	8 (5%)
14	Springer	28 (19%)	42 (28%)	49 (33%)	20 (13%)	11 (7%)
15	Anatomy.Tv.	36 (24%)	53 (35%)	38 (25%)	21 (14%)	2 (1%)
16	EBSCO	36 (24%)	52 (35%)	27 (18%)	32 (21%)	3 (2%)
17	Uptodate	37 (25%)	51 (34%)	46 (31%)	14 (10%)	2 (1%)
18	McGraw-Hill	24 (16%)	36 (24%)	73 (49%)	12 (8%)	5 (3%)
19	BMJ	30 (20%)	28 (19%)	72 (48%)	19 (13%)	1 (1%)
20	Open access free resources (Biomed Central, MedIND, free medical journals)	23 (15%)	31 (21%)	71 (47%)	23 (15%)	2 (1%)

Data presented in the above table 5 indicate the level of awareness of electronic information resources. The majority of the respondents 48% are to somewhat extent aware of E-journals, 7% are very much aware of E-journals, 53% opinion to somewhat extent aware of databases, 9% are not at all aware of databases. 52% respondents are somewhat extent aware of PubMed, 7% are not at all aware of PubMed, 22% much aware of clinical key and 11% respondents are very much aware of clinical key, 35% opined that they are very little aware Anatomy.Tv and only 1% are very much aware of Anatomy.Tv, 49% of respondents are to somewhat extent aware of McGraw-Hill, 3% are very much aware of McGraw-Hill.

Table-6: Usage of HELINET Consortia.

Sl. No.	HELINET Database	Use not at all	Very little use	To somewhat extent use	Much use	Very much use
1	Annual Reviews	27(18%)	21(14%)	59(39%)	36(24%)	7(5%)
2	Clinical key	35(23%)	18(12%)	43(29%)	49(33%)	3(2%)
3	Blackwell	38(25%)	26(17%)	51(34%)	32(21%)	3(2%)
4	MD Consult	38(25%)	20(13%)	30(20%)	57(38%)	5(3%)
5	OVID	33(22%)	24(16%)	33(22%)	58(39%)	2(1%)
6	Springer	35(23%)	37(25%)	30(20%)	46(31%)	2(1%)
7	Taylore & Francis	35(23%)	34(23%)	37(25%)	42(29%)	2(1%)
8	Theme Verlog	48(32%)	28(19%)	44(29%)	29(19%0	1(1%)
9	J-Gate	34(23%)	23(15%)	52(35%)	40(27%)	1(1%)
10	Bentham	40(27%)	31(21%)	47(31%)	31(21%)	1(1%)

Table 6 indicates that HELINET Consortia is used 39% to somewhat extent for annual reviews, 5% very much use for annual reviews, 18% use not at all for annual reviews, 33% Much use for clinical key, 2% very much use for clinical key, 39% much use for OVID, only 1% respondents much use for OVID, 31% much use for Springer, 23% use not at all for Springer, 35% respondents to somewhat extent use for J-Gate, 1% very much use J-Gate and 31% to somewhat extent use for Bentham, 27% use not at all Bentham.

Hence, from the above table it is clearly shown that in HELNET consortia database is useful overall for somewhat extent only.

Table-7: Searching Techniques of Electronic Information Resources

Sr	Search of E-Resources	Respondents	Percentage
1	Directly typing the URL Addresses	98	65%
2	Using the search engines	114	76%
3	Website links	78	52%
4	OPAC	51	34%
5	Boolean search	54	36%
6	Using the author/title name	88	59%

Table 7 shows that 76% of the respondents are using the search engines to search electronic information resources, followed by 65% directly typing the URL addresses, 59% using the author/title name, and 52% website links and 34% of respondents searching through OPAC.

Table-8: Frequently used Search Engines

Sr	Search Engines	Respondents	Percentage
1	Google	150	100%
2	MSN	26	17%
3	HotBot	-	-
4	Magellan	-	-
5	WebCrawler	2	1%
6	Alta vista	53	35%
7	Open Text	10	7%
8	Clinical App.	29	19%
9	WebMD	30	20%

Table 8 explains that 100% respondents use search engine Google, followed by 35% Alta Vista, 20% WebMD, 19% respondents use Clinical App and only 1% use WebCrawler. Hence, it is clear that 100% of users search with Google search engine.

Table-9: Format for Downloading Articles.

Sr	Formats	Respondents	Percentage
1	PDF	142	95 %
2	HTML	13	10%
3	MS-Word	43	29%
4	PPT	25	17%

Table 9 shows the format for downloading the article from the electronic information services. Majority of respondents (95%) use PDF, 29% MS-Word, 17% respondents use PPT and very less respondents (10%) use HTML. Therefore, majority of users use PDF format instead of other formats.

Table-10: Users Satisfaction with Electronic Information Services.

Sl. No.	Electronic Information Services	Highly Satisfied	Satisfied	Moderately Satisfied	Dissatisfied	Highly Dissatisfied
1	Internet search service	10(7%)	57(38%)	53(35%)	20(14%)	10(7%)
2	Email alert service	3(2%)	35(23%)	53(35%)	37(25%)	22(15%)
3	E-Document delivery service	4(3%)	41(27%)	55(37%)	26(17%)	24(16%)
4	Clinical information service	6(4%)	38(25%)	49(33%)	33(22%)	24(16%)
5	Online journals service	8(5%)	45(30%)	35(23%)	39(26%)	23(15%)
6	Online database search	14(9%)	30(20%)	44(29%)	37(25%)	25(16%)
7	SDI (Selective dissemination of information)	5(4%)	29(19%)	46(31%)	46(31%)	24(16%)
8	CAS (current Awareness services)	5(4%)	44(29%)	33(22%)	46(31%)	22(15%)

Table 10 shows that majority of the respondent's i.e. 38% are satisfied with the internet search service, followed by 35% are moderately satisfied with e-mail alert service and 15% are highly dissatisfied. With regard to online journal services 30% of them are satisfied, 5% are highly satisfied with online journals services. With regard to SDI services 19% are satisfied and 16% of them are highly dissatisfied. 22% responded that they are moderately satisfied with the current awareness services and 15% are highly dissatisfied.

VII.   FINDINGS

Most of the medical students and faculties use internet for the purpose of data communication i.e. 85%.

Majority 83% of them use electronic information resources for supporting teaching activities, 78% for clinical practice and 70% for undertaking research.

The majority (85%) of respondents were aware of electronic information services through personal communication with friends, subject experts and resource persons, 66% from search engines, 65% are aware by friends/teachers and 41% by e-mail alerts form publishers/distributors etc. However 48% have respondents are, to somewhat extent aware of E-journals, 53% opinion is that they are to somewhat extent aware of database, 52% respondents are somewhat extent aware of PubMed, in the HELINET consortia 39% of them use for annual reviews to somewhat extent, 33% much use for Clinical key and 31% to somewhat extent use for Bentham.

The majority of users indicated that 76% respondents are using the search engines to search electronic information resources, 65% by directly typing the URL address, 34% respondents through OPAC. Majority i.e. 100% of respondents used search engines Google, 35% used Alta Vista. Most of the respondents i.e. 95% download the article from the electronic information resources through PDF format.

Majority i.e. 38% are satisfied with the internet search services, 35% are moderately satisfied with E-mail alert service and 22% respondents are moderately satisfied with the current awareness services.

VIII.   SUGGESTIONS

In the data analysis result, faculties were using internet for data communication, concerned authorities should give orientation for faculty about usage of internet for other purpose.

Majority of faculty were using EIRs for their clinical practice. But libraries should give advices for them to use EIRs for other purpose.

Majority of respondents were not completely using electronic information services (EISs). Hence, concerned authorities should take appropriate action for 100% usage of EISs.

From the table search engines, majority of users are depending on Google for search. Hence, librarian and other authorities should make them to change or to use others search engines.

IX. CONCLUSION

The present study concluded that emerging technologies have dynamically changed the way information is gathered, organized, accessed, stored and consumed. Electronic information resources (EIS) are the need for the research and academic activates and help in faster access and retrieval of information in various disciplines activities. Looking at the present study, the information explosion and competency in acquiring it, it is on the part of the library staff to create more awareness about the electronic information resources availability among the users and provide them a friendly environment so that they can make better use of facility (Rai, 2014). Therefore, the library staff requires training in handling the electronic information resources and users need an orientation for using them. Library staff should be provided proper training, which will help them acquiring more sophisticated searching and retrieval skills. The librarians' role has to be redefined in view of technological development keeping in mind the best interest of users and retrieval efficiency. Further result of this study confined that majority of respondents did not get any training related to Electronic information resources but they are not getting trained. Some of them are willing to get trained for some specific things like to enhance their searching skills and for using electronic information resources in better way.

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Research Trends in Total Quality Management (Tqm): A Comparitive Assessment of Publication Output of India and Japan Using Scientometrics

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ABSTRACT

The study examines Indian and Japan Total Quality Management analysis output on several parameters at the side of growth, analysis communication in core journals, and geographical distribution of publications. The study focuses on the articles disclosed by Indian and Japan and indexed in Science Citation Index – web of Science for the periodfrom 2012 to 2016. India has published 811 papers within the TQM field and received 12768 citations and Japan has published1095 papers and received 9044 citations in the field during the period 2012 to 2016. The study suggests the need to increase the pace of Indian and Japan scientific discipline analysis and improve their quality. It suggests boosting the building ability and mental object to help bridge the scientific discipline gap with leading countries. It conjointly counsels to make competency and knowledge domain to assist bridge the gap between leading countries.

Keywords : Doubling time, Growth of rate for Scientific publication, Total quality management, Relative growth rate, Scientometrics

I. INTRODUCTION

The importance of knowledge has been recognized like never before in the history of human civilization, particularly scientific and social knowledge. "Few dispute the claim that a nation's science and technology base is a critical element of its economic strength, political structure and cultural validity", says (Garfield & Welljams-Dorof, 1992). The national developments are going to be increasingly dictated by the research and development. Today there is a tremendous desire in virtually every country to step up investment in Science & Humanities (S & H) research and to reap the benefits of such research.

There is a need to assess different basis upon which the scarce resources can be allocated to different areas of scientific and technological research both human and economic. An important and tangible component of studies in information sciences is citation analysis, for assessing the extent of utility of research publications in journals, conference /seminar /symposium proceedings and other literature, at national and international levels.

According to (P é ter Vinkler, n.d.) ― Scientometrics indicator is a Scientometrics measure which can be attributed to Scientometrics organizations ‖ and which can be classified into basic indicators, e.g., number of citations, number of

synchronous references, and number of papers, etc; and complex ones which is based on relations between the referencing and referenced sets. Bibliometrics, a subfield of Scientometrics or the science of science itself, offers a robust set of ways and measures for finding out the structure and processes of intellectual communication. Citation analysis, the known bibliometric approach, is widely utilized in analysis output analysis for assessing research performance or impact of researchers, establishments, regions, articles, journals, etc. Despite its wide use, there are opinions that deny the intrinsic worth of the citation analysis outcomes. even so, the self-same author of the citation indexes distinguished that citation counts couldn't determine significance that was unrecognized by the scientific community(Garfield & Merton, 1979). For qualitative analysis, as a mirrored image of the community's work and interests, fitness needs peer judgments.

In the Eighties and Nineteen Nineties, there began a brand-new part of internal control and management, that became called Total Quality Management (TQM). Having ascertained Japan's success at quality development, western firms began to introduce their own quality initiatives. TQM was developed as an enclosure phrase for the broad spectrum of quality-focused ways, programs, and techniques throughout this era, and have become the centre of focus for the western quality movement. Initial TQM definitions were client cantered. However, as time progressed following the event of business excellence models—the definitions became broader and cantered on all stakeholders.TQM is predicated on the number of concepts. It means that puzzling over quality in terms of all functions of the enterprise and maybe a start-to-finished method that integrated reticular functions in the slightest degree levels. it's a systems approach that considers each interaction between the varied parts of the organization (Ross, 2017).

Total Quality Management (TQM) and Japanese Management System (JMS) as two-sided coin. Both complement one another. the link between Total Quality Management and Japanese Quality Management System are thus shut that some have the understanding that TQM might solely achieve success in Japanese culture. Current socio-economic scenario of Japan has created new ways that of perceiving Japan aggressiveness. which stand on the thought of long employment, is currently seen as not relevant in today's quick pace business world. once JMS is collapsing, TQM has lost its half; so, being labelled as superannuated management system. the guts of TQM, continuous improvement is being suspect as the block obstructive innovative thinking for the Japanese and so moving Japan's aggressiveness. The authors disagree! The authors believe that the link of JMS and TQM is moving to a brand-new era wherever there are rather more to be told from the Japanese experience.

Objectives:

1. To assess the research productivity in total quality management for a specific period of 2012-2016

2. To know about GrowthofIndia and Japan publications.

3. To assess the contribution of Prolific Research Institutions

II. REVIEW OF LITERATURE

There don't seem to be several bibliometric studies in a scientific discipline. (Jagadeesh, 1999)The various surveys severally conducted by researchers and business publications have disclosed that awareness on quality of merchandise and services has picked up in India. With quality-based competition thickening, Indian industries and businesspeople are showing a keen interest in up the standard of merchandise through TQM. many organizations, non- public, and Government are actively propagating TQM through a spread of coaching and academic programs. TQM has evidenced to be a significant ingredient for fulfilment and currently has its permanent roots within the ``mission and vision'' of the Indian company sector.

(Ravichandra Rao and Suma) analyzed Republic of Indian engineering literature and located that engineers in India publish during a choose few journals and engineering analysis is targeted in a few establishments in. They determined that analysis output in applied physics, light-weight and optics, technology and knowledge science are increasing each at the planet and Republic of India levels.Karamourzov8 assessed the results of freelance development of the CIS countries within the field of science over the amount 1990–2009. , Tsay, Arunachalam, Kostoff, Sangam, Biradar, Sangam, Gupta, Bhattacharya dole out similar Scientometrics studies to assess research project outcome in numerous topics like output, comparative studies between countries, collaboration patterns studies, growth pattern, etc.

III. METHODOLOGY

The data for this study was collected from the ScienceCitation Index- Expanded (SCI-E) of Web of Science, acomprehensive and exhaustive database enveloping almostall subjects of Social Sciences. Its coverage of Social field is quite comprehensive. The distributionof publications, source wise distribution, most prolificinstitutions, leading research areas, prolific authors,highly cited papers, and international collaboratorscan be retrieved from the database. The database wassearched for collecting documents in the areas of Total Quality Management, Quality Assurance, Quality Control, TQM, published between 2012 and2016.

Table 1   Growth of Publication

Publication Year	Japan	India
2016	241	153
2015	205	147
2014	239	155
2013	221	158
2012	189	198
2011	162	156
2010	189	141
2009	174	124
2008	149	132
2007	137	88

Figure 1. Doubling time of Total Quality management publicationfrom India and Japan
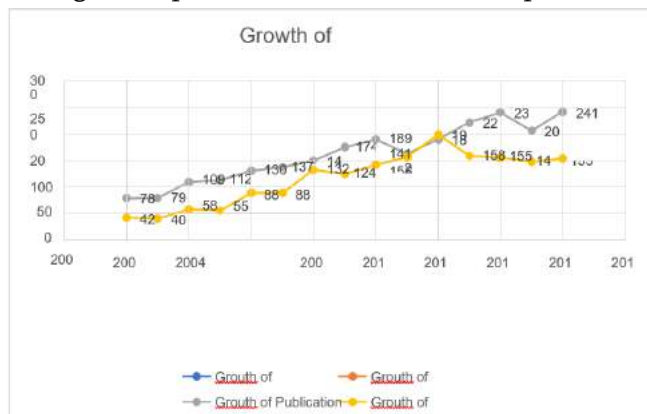
IV. RESULTS AND DISCUSSION

4.1 Growth of Publications

One of the apparent options of scientific literature in recent years has been its rate of growth. range of growth models are planned during this regard. In 1963 Price18 planned Associate in Nursing exponential rate of growth of scientific literature. He expected a daily exponential growthwith doubling amount of 10 to fifteen years. within the topics thought about during this study it absolutely was found that the articles from Total Quality Management analysis output of Asian country and Japan in terms of total range of publications and citations, citations per papers are illustratein Table2. India has published 811 papers and received 12768 citations throughout the amount 2012-2016, Citations per Paper is 15.74. As per the Web of Science knowledge, accumulative publications growth, the accumulative output of India had inflated from 198 articles in 2012 to 153 articles in 2016. the information collected for this study shows a gradual decrease over the years. Japan published 1095 articles and received 9044 citations throughout the amount 2012-2016 with a mean citation per article being 8.25. Japan has printed 189 articles in 2012 and 241 publications in 2016. the information for this study shows a gradual increase over the years. Figure 1 shows the annually inflated citations received by each country. The publications from each country have inflated year by year. One vital

issue note to it India has cut the expansion of articles year by year.

	India				Japan			
Years	TNP	TNC	CPP	RCI	TNP	TNC	CPP	RCI
2016	153	3661	23.93	1.52	241	3580	14.85	1.80
2015	147	3004	20.43	1.29	205	2690	13.12	1.60
2014	155	2418	15.6	0.99	239	1748	7.31	0.89
2013	158	1986	12.57	0.79	221	849	3.84	0.46
2012	198	1699	8.58	0.54	189	177	0.93	0.11
	811	12768	15.74		1095	9044	8.25	

Table header: Growth of Publications

(TNP, total number of publications; TNC, total number of citations; CPP, citations per paper; RCI, relative citation impact forms. (The citation impact is basically the number of citations per paper that that group has received over a certain time period., in the Table 2 the RCI is calculated as CPP divided by average CPP)
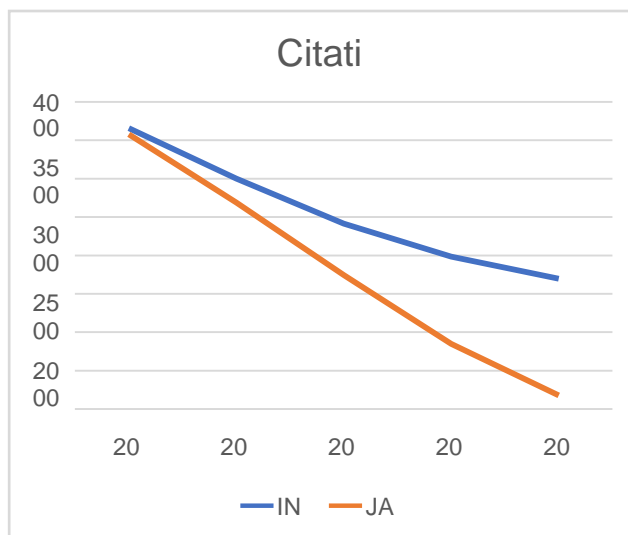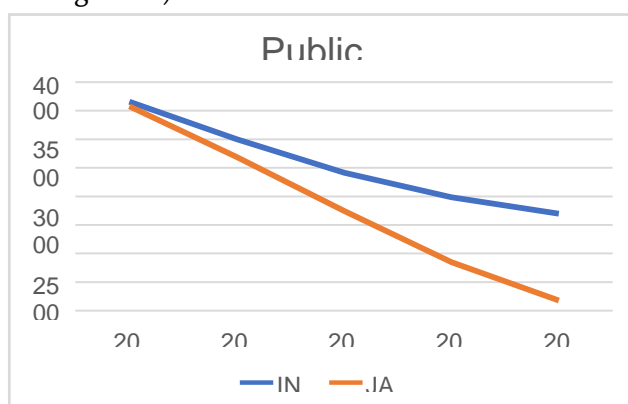

Figure 2. Pattern of growth of publications in Total Quality Management in India and Japan (2012 – 2016).

Prolific Research Institutions

Table 3 displays results of top institutions and comparisonbetween India and Japan based on number ofpublications. INDIAN INSTITUTE OF TECHNOLOGY SYSTEM IIT SYSTEMcontributed the highest number of articles, i.e. 138 articles with 7.95%COUNCIL OF SCIENTIFIC INDUSTRIAL RESEARCH CSIR INDIA,Bangalore with 137 articles (7.90%) is a distant secondfollowed by BHABHA ATOMIC RESEARCH CENTERwith 94 articles (5.42%). With regard to Japan the UNIVERSITY OF TOKYO, has published the highestarticles i.e. 204 (6.53%), followed by KYOTO UNIVERSITY, with 92 articles (4.40%), Osaka University with 86 articles (7.854) RIKEN, with 525 articles (7.671%),JAPAN SCIENCE TECHNOLOGY AGENCY JST,with 63 articles (5.753%), KYUSHU UNIVERSITY, with 53 articles(4.84%), NAGOYA UNIVERSITY,with 46 articles (4.201%), NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE TECHNOLOGY AIST, with 44 articles(4.012%) and TOHOKU UNIVERSITY, with 42 articles (3.836%).

INDIA

Table 3

INDIAN INSTITUTE OF TECHNOLOGY SYSTEM IIT SYSTEM	138	7.95%
COUNCIL OF SCIENTIFIC INDUSTRIAL RESEARCH CSIR INDIA	137	7.90%
BHABHA ATOMIC RESEARCH CENTER	94	5.42%
INDIAN COUNCIL OF AGRICULTURAL RESEARCH ICAR	59	3.40%
INDIAN INSTITUTE OF TECHNOLOGY IIT DELHI	35	2.02%
JADAVPUR UNIVERSITY	34	1.96%
JAMIA HAMDARD UNIVERSITY	34	1.96%
NATIONAL INSTITUTE OF PHARMACEUTICAL EDUCATION RESEARCH NIPER	33	1.96%
INDIAN INSTITUTE OF CHEMICAL TECHNOLOGY	30	1.73%
TATA MEMORIAL HOSPITAL	30	1.73%
JNTUK UNIVERSITY COLLEGE OF ENGINEERING	29	1.67%
ALL INDIA INSTITUTE OF MEDICAL SCIENCES	28	1.61%
DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO	28	1.61%
INDIAN INSTITUTE OF TECHNOLOGY IIT KHARAGPUR	27	1.56%
DR REDDYS LABS LTD	26	1.50%
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD	26	1.50%
NATIONAL BOTANICAL RESEARCH INSTITUTE INDIA	26	1.50%
INDIAN INSTITUTE OF TECHNOLOGY IIT MADRAS	25	1.44%
DEPARTMENT OF SCIENCE TECHNOLOGY INDIA	24	1.38%

ANDHRA UNIVERSITY	22	1.27%
CSIR CENTRAL DRUG RESEARCH INSTITU	22	1.27%
GUJARAT UNIVERSITY	22	1.27%
CHRISTIAN MEDICAL COLLEGE HOSPITAL CMCH VELLORE	21	1.21%
INDIAN INSTITUTE OF SCIENCE IISC BANGALORE	20	1.15%
BHARATI VIDYAPEETH DEEMED UNIVERSITY	18	1.04%
UNIVERSITY OF CALIFORNIA SYSTEM	17	0.98%
INDIAN COUNCIL OF MEDICAL RESEARCH	16	0.92%
INDIAN INSTITUTE OF TECHNOLOGY IIT KANPUR	16	0.92%
ANNA UNIVERSITY	15	0.87%
CENTRAL INSTITUTE OF MEDICINAL AROMATIC PLANTS INDIA	15	0.87%
DEPARTMENT OF BIOTECHNOLOGY DBT INDIA	15	0.87%
KARNATAK UNIVERSITY	15	0.87%
UNIVERSITY OF MYSORE	15	0.87%
ICAR INDIAN VETERINARY RESEARCH INSTITUTE	14	0.81%
INSTITUTE OF HIMALAYAN BIORESOURCE TECHNOLOGY	14	0.81%
SAVITRIBAI PHULE PUNE UNIVERSITY	14	0.81%
ANNAMALAI UNIVERSITY	13	0.75%
MINISTRY OF EARTH SCIENCES MOES INDIA	13	0.75%
PGIMER CHANDIGARH	13	0.75%
PSG COLLEGE TECHNOLOGY	13	0.75%
ST XAVIERS COLL	13	0.75%
UNIVERSITY OF LONDON	13	0.75%
ALIGARH MUSLIM UNIVERSITY	12	0.69%
ANNA UNIVERSITY CHENNAI	12	0.69%
INDIRA GANDHI CENTRE FOR ATOMIC RESEARCH	12	0.69%
JAMIA MILLIA ISLAMIA	12	0.69%
NATIONAL INSTITUTES OF HEALTH NIH USA	12	0.69%
INDIAN INSTITUTE OF CHEMICAL BIOLOGY	11	0.63%
INDIAN INSTITUTE OF TECHNOLOGY IIT BOMBAY	11	0.63%

JAPAN

Table 4

Organizations-Enhanced	Records	% of 1095
UNIVERSITY OF TOKYO	105	9.589
KYOTO UNIVERSITY	92	8.402
OSAKA UNIVERSITY	86	7.854
RIKEN	84	7.671
JAPAN SCIENCE TECHNOLOGY AGENCY JST	63	5.753
KYUSHU UNIVERSITY	53	4.84
NAGOYA UNIVERSITY	46	4.201
NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE TECHNOLOGY AIST	44	4.018
TOHOKU UNIVERSITY	42	3.836
HOKKAIDO UNIVERSITY	35	3.196
HIROSHIMA UNIVERSITY	32	2.922
NATIONAL CANCER CENTER JAPAN	32	2.922
OKAYAMA UNIVERSITY	32	2.922
NATIONAL INSTITUTE OF HEALTH SCIENCES JAPAN	28	2.557
TOKYO MEDICAL DENTAL UNIVERSITY TMDU	28	2.557
KEIO UNIVERSITY	22	2.009
KUMAMOTO UNIVERSITY	22	2.009
JUNTENDO UNIVERSITY	21	1.918
NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES JAPAN	21	1.918
NATIONAL METROLOGY INSTITUTE OF JAPAN	21	1.918
NAGOYA CITY UNIVERSITY	20	1.826
TOKYO INSTITUTE OF TECHNOLOGY	20	1.826
CHIBA UNIVERSITY	19	1.735
GUNMA UNIVERSITY	19	1.735
NIIGATA UNIVERSITY	19	1.735

4.1. Source-wise Distribution of Research Output

The sources of Total quality management research include articles published in journals, reviews, conference and seminars proceedings, editorials, meeting abstract and book chapters (Table 5). A total of 1938articles in total quality management were published from India and Japan from 2012 to 2016. Out of them, journal articles accounted for 1634,

(84.31%) from both countries. The comparative analysis indicates journal articles accounted for 88.16% of India's output and 81.54% of Japan's output.

Table 5.   Source-wise Distribution of Research Output of India and Japan

Document Type (INDIA)	Publication	%	Document type (JAPAN)	Publication	%
ARTICLE	715	88.16	ARTICLE	919	81.54
Review	63	7.77	REVIEW	121	10.74
PROCEEDINGS PAPER	13	1.60	MEETING ABSTRACT	42	3.73
MEETING ABSTRACT	12	1.48	PROCEEDINGS PAPER	25	2.22
Editorial Material	4	0.49	EDITORIAL MATERIAL	13	1.15
DATA PAPER	2	0.24	DATA PAPER	7	0.62
BOOK REVIEW	2	0.24	BOOK CHAPTER	-	-
	811	100		1127	100

V. CONCLUSION

The present study provides a scientometric analysis of Total quality management analysis in India and Japan. both the countries are robust in Total Quality management, with a varied focus. India lacks in terms of number of publications during the study period. whereas Japan scores high compared to India thought about for the study. Nevertheless, the no of citations received by Indian articles are reasonable high and gives us an indication that the articles were of significant value to the research community. We can also see despite lesser number of Japan Institutes that are available in the data, there is a reasonable contribution from all the institutes to create more publications when compared to India.

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Best Practices in Media Libraries

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ABSTRACT

The Author has presented her observations by means a framework, and to stimulate their thoughts. News analysts, reporters, and correspondents gather information, prepare of exploring various best practices carried out in a Media Libraries. Author has explained in detail about the Newspaper and Importance of Libraries in Newspaper Libraries.

Keywords : Best Practices, Media Libraries, Newspapers, Digital Libraries

I. INTRODUCTION

Newspapers are the mirror of society and also the agents of social change and the creators of attitude and situations. They conduct companies, carry on propaganda, influence and educative voters, canalize public opinion and mould government policies. The press also makes a direct and visible impact on the functioning of the administration and political systems of the country. It provides comprehensive and objective information on all aspects of the country's social, economic, political and cultural life. Newspapers bring every person into touch with the active world. As Mahatma Gandhi said, 'One of the objectives of a newspaper is to understand the popular feeling and give expression to it, another is to arouse among the people certain desirable sentiments and third is fearlessly to expose popular defects.

Newspapers occupy an important place among various information sources in a library. They satisfy the requirement for information on recent events occurred at local, regional, national, international levels. They popularize in understanding and awareness on numerous issues. They are at the reach of majority of population in any society.

The functions of a newspaper library as J. Lewis in his booklet on "Newspaper Libraries" defines it, is "to act as depository of all information required by the editorial and management departments of a newspaper". The definition is rather inadequate. For, it is not enough to store all the material. Since many years newspaper has been considered as an important source of information. The generation of current and varieties of information in large quantity makes it distinct from other information media. It is frequently used by people from all strata of the society for their current awareness, and is used considerably by the academicians, researchers and practitioners, politicians and administrators, economists, and many others in various fields of knowledge and activities seek information from

newspapers for solving day-to-day problems and/or for their research work.

Journalists, by nature of their profession, are information gatherers. They need information for scrutinizing the facts, raise their awareness of current news, research, obtain

stories, and make broadcasts that inform the public about local, State, national, and international events. They also present their points of view on current issues as they believe that public enlightenment is the forerunner of justice and the foundation of democracy. In order to do their day-to-day work, they require information from various formal as well as informal sources including their colleagues and libraries. Even in the current IT scenario, newspaper/ media libraries still serve a unique function of providing information to journalists through trained and educated professionals.

The Printed World and the Electronic Invasion

In the traditional technology, the printed world was the only product. But with the introduction of the computer and the electronic media, the fundamental product is now a data base.

In comparison Nine Essential qualities of Print Media are

a) **Portability:** Ever since the ancient Egyptians developed papyrus, humans have preferred light-weight documents that could be easily transported and stored.

b) **Simplicity:** Paper-based documents are easily stored and retrieved, although as the number of printed documents grows the organizing systems increasingly more complex.

c) **Readability:** Paper will remain the best display medium for reading textual documents for quite some time to come.

d) **Durability:** Paper books and periodicals can be preserved for long years even without any special measure, like air conditioning.

e) **Longevity:** Printed documents can be read directly but not digital documents; they all require an electronic device and special software to be understood.

f) **Portrait-oriented, Page-Based Format:** Books have existed in their present form i.e. in codex format for at least two thousand years. They could contain virtually unlimited volume of information and could be more easily browsed and navigated than the scroll format. They also wear more durable and easier to copy, transport and store.

g) **Affordability:** Today, practically everyone has access to books and other forms of print media

h) **Reliability:** Printed documents have the great advantage of not requiring special tools or electrical power to be read, which makes them an exceptionally reliable form of communication media.

i) **Personalization:** The ability to highlight or under line items, to add notes in margins to book mark pages and to other wise personalize books and documents is possible where the content is printed on paper.

Digital libraries are large, organized collection of information objects. Whereas standard library automation systems provide a computerized version of the catalog – gateway into treasure – house of information stored in the library- digital libraries incorporate the treasure itself, namely the information broadly knowledge that constitute the library's collection The tools used by newspaper libraries in their daily work have changed vastly during recent years. Today, all the newspaper libraries are equipped exactly as it was only a few years ago. In addition to traditional means like card catalogs and newspaper clippings, photos, microfiche readers, most libraries now also an online access catalog, District editions equipped with Internet connection. An increasing number of branch libraries are building homepages on the World Wide

Web from where users have access to a variety of services without physically entering library. Almost all newspaper libraries are in transit from the traditional towards the digital library. We witness a shift from libraries offering information about (electronic and print) information towards providing access to full text of documents. Not only recent publications, but also many historical news items being digitized. These electronic collections allow journalists and other news making staff from everywhere at any time to consult the material without doing any harm to fragile documents.

II. IMPORTANCE OF THE LIBRARY TO THE NEWSPAPERS OFFICES

The more efficiently a newspaper can relate and tally past information on a subject or person with current information, the more effective will it be. The proper meaning and interpretation of news event, plan or programme can be obtained only when studied against its background. The newspaper must project the event in it can be quickly understood by the reader. Items of new received thought various sources have to be processed, made readable and interesting, facts have to be checked and background material to be added. The library plays a vital role in linking events to its background. 'To dig on the background, the services of memory unit, intelligence unit for reference section becomes essential for the editorial department. Checking of facts and adding of background data is the province of the information staff. The Librarian and his/her team of trained assistants. They capture current information, index it, abstract it or keep it in full and make it available rapidly on demand by the editorial staff. The library is the backbone of a newspaper establishment. There the different need of various departments. The journalist today has greater need of the library, because his/her job involves more hard thanking and hard searching than it ever did, say thirty or forty years ago. The decision to have a library specially designed to provide information for the newspaper is usually made by someone in management who recognize the advantages of a professional research service.

III. ROLE OF LIBRARY & LIBRARIAN IN NEWSPAPER LIBRARY

Library always plays a vital role in the society to improve the quality of education and awareness. Libraries which hold newspaper collections and provide services based on them, and users wishing access to newspapers and their contents have been experiencing times of change for some years and will continue to do so in future. The development of new technology increased & improved the information access activity. So this is the time for reviewing that how much traditional newspaper library & computerized library is useful to the users.

IV. LIBRARY COLLECTION

Libraries have the documents in abundance; some of them are as follows.

a)   Newspapers
b)   Journals and Magazines
c)   Books
d)   Research Reports, Proceedings
e)   Newspaper Clippings
f)   Electronic Resources
g)   Photographs
h)   Supporting Documents in the form of facts, tables, statistics
i)   Illustrations, Maps, Charts, Drawings, Cartoons
j)   Database, CDs etc.

Besides these collection libraries does provide many services as follows.

a)   Circulation
b)   Inter Library Loan
c)   Reference Services
d)   Resources Sharing through developing a group

e) CAS and SDI Services
f) Newspaper Clipping Services
g) Periodicals Indexing Services
h) Microfilm Services
i) Reprographic Services

The advent of the Internet and other online services has changed the library from a more entity to an information system. So we are moving to global information resources for our need. According to James Michael Following blue print should have a library

a) Inter connectivity- Networking, Uniformity of data storage and location, etc.
b) Interoperability – Several computers working to each other.
c) Integration – Internal and External Resources into one single user interface.
d) Intermediation – Reference Services, Guided research assistances and instruction for user.
e) Interdependency – Resource Sharing and Information Exchange, because one library cannot have everything that might be required by users.
f) National Newspapers: - To get the update news we can go to digital libraries of prominent Indian newspaper group some of them are as follows – Asian Age, Business Line, Business Standard The Live Mint, Deccan Herald, DNA, Economic Times, Financial Express, The Hindu, Hindustan Times, Indian Express, Telegraph, Statesman.

There is so many other important newspaper of India & its State are publishing and nourishing the information needs. So we see that any type of libraries which work as information centre also always should be ready to deliver the information of its user whether they use traditional system or modern techniques. As we have assumed that the newspaper does work as 'Daily Update Encyclopedia' to its user. So we shall take the aggressive step ahead for maintaining to its infrastructure &

responsibilities, that's why we can preserve our culture & most needful newspaper and as well as other documents. Libraries which had newspaper collections and provide services based on them, and user wishing access to newspaper and their contents have been experiencing times of change for some years and will continue to do so in future. As access point of view, the limitation of traditional approaches should be well known to the library in-charge and involved to the research users group of newspapers. Therefore today the access of news & views is so most important for the different categories of user and it is challenging of its maintenance for any kind of library. So library and Library Staff should perform the responsible duties and well familiar to the different rules and regulations concerning different acts, tools etc., for the sharpening the library services.

V. BEST PRCTICES

DEFINITIONS
ODLIS (Online Dictionary of Library and Information Science) describes best practices as follows: "In the application of theory to real-life situations, procedures that, when properly applied, consistently yield superior results and are therefore used as reference points in evaluating the effectiveness of alternative methods of accomplishing the same task. Best practices are identified by examining empirical evidence of success."

Oxford English Dictionary describes 'Best practices as quality of most excellent or desirable type or most appropriate, advantageous, highly improved, outstanding, par excellence services or the customary or expected procedure or way of doing something that is usual or expected way in a particular organization or situation, guidelines for good practices. In this process of developing best practices we take action rather than good ideas, and we improve our skills.'

According to National Board of Accreditation and Assessment (NAAC) "Best practice may be innovative and be a philosophy, policy, strategy, program, process or practice that solve a problem or create new opportunities and positively impact on organizations. Institutional excellence is the aggregate of the best practices followed in different areas of institutional activities." NAAC recommended best practices: Best practices are available on NAAC website and they assure that regular updating will be made with consultations on contributing institutions.

VI. BEST PRACTICES IN NEWSPAPER LIBRARIES

a)	Library Hour : Library remains open from 9am to 7pm Library will function throughout the year except 4 days of national holidays

b)	Orientation Programme: Orientation is one of the best practices to create awareness among the users about the library resources, services, for maximum utilization of the library.

c)	Book Exhibition: Arranging book exhibition on different occasions, displaying rare books, newly added books or books of particular subject which are available in the library. This will lead to increased awareness among readers about knowledge wealth the library possess they can demand the books accordingly.

d)	Library staff should be well trained and the library users should be educated in digital resources management

e)	New Arrivals List: The list of newly available books should be displayed on notice board which makes the reader aware about the new reading material so that accordingly he/she could demand for those new books & get it.

f)	Library Brochure: It is one of the important sources for creating the awareness about the library environment, services & collection of the library. Users can be provided the information broacher at the time of Orientation. The information brochures include information about the library facilities, like

Xerox, Microfilm services, internet etc, latest publications, latest editions to the library, CD / DVD list, library rules & regulations, electronic resources & online information services etc.

g)	Receiving regular feedback from the journalists, and implementing their suggestions

h)	Understanding needs of journalists, from the day of joining to the company

i)	Induction training programme to new joiners both trainee and permanent employees

j)	Team working in day to day activities

k)	Information retrieval to editorial team and other journalists

l)	Indexing and Archiving of Newspaper and published photos in the newspapers

m)	Maintenance of Newspaper clippings

n)	Microfilming and Binding work of newspaper

o)	Performing the regular activities of library such as acquisition, cataloguing, classification of new books arrived to the library

p)	Collection Development of newspapers, books and journals

q)	Providing the Reference and referral services to the journalists

r)	Supporting to editorial staff for retrieving information from archiving

s)	Protection of digital resources using high technology can be considered

t)	High quality ICT tools should be selected to enhance the equality of digital resources

u)	While designing a standard metadata schema and information storage retrieval system the library staff and the end-user groups are to be kept in mind, besides matching them with the information resources

v)	Best practices' could cover areas such as, successful business strategies adopted, systematic digitization processes followed, appropriate metadata formats used, suitable digital archiving methods adopted,

w)	Best practices in scanning of newspapers from microfilm collection for ensuring inexpensive scanning and low conservation costs

x) Capacity building of internal skilled manpower for their contribution in digital preservation projects, as part of their daily activities

y) Another area in terms of best practices could be while deploying the best possible digitization tools and technologies, it is always necessary to keep the end- users in mind.

z) To improve the end-user information search and retrieval capabilities centers to organize training and demo session in the usage of its digital archives for its internal users.

VII. CONCLUSION

Newspaper libraries are invaluable for the press and the effectiveness of the press largely depends on the effective and well organized libraries in their organizations. The best practices help for improving quality of library services. The best practices adopted in newspaper libraries should bridge the gap between library collection & user community for maximum utilization of the resources. Library adopted various best practices in its administration, management, collection & services, extent of the use of services and use of technology. The technology based services are essential for providing up-to-date information to user community. In its effective implementation that makes significant change in enhancing the use of information sources/services and users satisfaction level.

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Creating QR Codes for Doctoral Theses : An Experimental Approach for Accessing Bioscience Theses in Shodhganga by using QR Codes at Kuvempu University

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ABSTRACT

QR (Quick Response) codes are used to promote library services and help users to access information quickly. The present study aims to explore the areas of QR code application in library services by experimenting at Kuvempu University. In this article, an attempt has been made to create QR codes for Bioscience theses of Kuvempu University available at Shodhganga ETD repository to provide quick access to URLs of theses. With the help of smart phones users can find theses quickly and independently. This article will explain how QR codes can be used for linking resources and describe issues surrounding their use.

Keywords : QR Codes, Library Services, Shodhganga, Bioscience Theses, Kuvempu University.

I. INTRODUCTION

New and emerging technologies have always been playing the vital role in shaping the different services of libraries. These technologies not only help the users to access quick, quality and efficient services but also provide a chance to library and information professionals to think outside the box to make their services effective and responsive. Of the technologies that have been developed and used in libraries, QR codes offer a wide variety of useful applications for libraries, and as more and more users begin to use smart phones and other mobile devices, libraries all over the world have been trying to utilize them for the betterment of their services libraries need to find ways to reach those users.

In the last two decades, libraries are facing tremendous changes as the modern tools and technologies have grown rapidly. Library materials are also changing quickly to the various digital

formats from the traditional print formats. Information/knowledge has been creating and publishing from every sector of humankind. Document types are also not limited to books and periodicals. Various types of materials out there like-image, audio, video, painting, artefacts, three-dimensional, software, and much more. These materials are also available with various file formats so that, one can use information in many ways. Lastly, the Internet has opened the door to reach anything or anybody from anywhere with just a single click. So, managing this huge amount of resources becomes more challenging day by day. Now QR codes have appeared in magazines, newspapers, cashless shopping, retail stores and several other places. Ashford [1] opined that, QR

codes would not replace any technology, however efficient uses of these QR codes can enhance the user experience at large and alter how s/he interacts with the academic libraries, the librarians and the library collection. The present study aims at providing quick access to Bioscience theses collection of Kuvempu University by creating QR codes.

II. OBJECTIVES OF THE STUDY

The main objectives of the present study are:

- To study the features of QR Code.
- To explore the areas of QR code applications in library services.
- To create QR codes for Bioscience theses of Kuvempu University available at Shodhaganga ETD repository.
- To provide quick access to the Bioscience theses.
- To create awareness about the QR code usage in libraries.

III. METHODOLOGY

Creating a single QR code is a simple process. There are many free QR code generators available. For the present study the researcher used QR code generator for creating QR codes for Bioscience theses of Kuvempu University. This code generator allows four different content types, a URL, text, phone number, or SMS and a choice of four sizes—small, medium, large, or extra-large. Creating a code is as simple as choosing a content type, adding your URL or other data, and clicking the "generate" button. The QR code is immediately created and can be copied, saved, or embedded. An easy-to-use Google Chrome QR code extension allows one to create a QR code while visiting any URL in one easy click. A QR code is instantly generated and pops down from the corner of the browser's address bar, with an option to save to disk or share on Face book.

For generating QR codes, the researcher used the following steps.

- Selected QR code generator website (ex.: http://www.qr-code-generator.com) and added it to the Google Chrome as an extension.
- Selected the URL of the Bioscience theses uploaded to the Shodhaganga ETD repository. A total of 297 URLs have been selected.
- Creating QR Code for the URL's of 295 Bioscience theses using QR Code Generator.

## IV. SCOPE AND LIMITATIONS OF THE STUDY

The present study aims to create QR codes for Bioscience theses of Kuvempu University available at Shodhaganga ETD repository. The study covers only theses submitted to the various departments under Bioscience discipline. These departments include Applied Botany, Biotechnology, Applied Zoology, Environmental Science, Microbiology and Wildlife Management etc. A total of 297 theses have been selected for the present study. The researcher created QR codes for all 295 theses using QR code generator.

V. WHAT IS A QR CODE?

QR code is a two-dimensional barcode were invented in 1994 by the Toyota Motors subsidiary Denso Wave to track vehicles and parts during the manufacturing process. The QR code consists of black modules (square dots) arranged in a square grid on a white background. The information encoded may be made up of data (numeric, alphanumeric, byte / binary, Kanji) or, through supported extensions, virtually any type of data. A QR code is read by an imaging device, such as a camera, in a mobile phone and there a number of different barcode scanner applications such as Red Laser, Barcode Scanner and QR Scanner that can read and decode data from a QR code. The majority of these are completely free, and all you have to do once you install one is to use your phone's camera to scan the barcode, which will then automatically load the encoded data for you [2].

The QR code, similar to a barcode, is an example of an information matrix. However a significant difference in the two is that a barcode only holds information nicely in the horizontal direction up to 30 numeric characters and a QR can do so vertically as well.

Fig.1 QR Code & Barcode
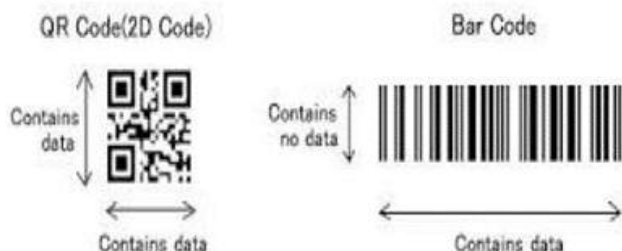
The data encoded can include numbers, alphanumeric characters' symbols, text symbols such as kanji (Japanese language symbols) as well as control codes.

VI. FEATURES OF QR CODE

- Easy to use-just held mobile device up to frame the code and scan.
- Supports IOS and Android
- Easy to install and configure
- Allow users to easily scan QR Codes Using the App, and be redirected to a source of information detail page

VII. APPLICATION OF QR CODE IN LIBRARY SERVICES

With the advent of ICT and awareness of technology among people, QR codes are being used everywhere. According to Parabhoi et al. [3] QR codes can be used in library books, journals CD- ROMs, ticketing, entertainment and transport ticketing, VCard information, commercial tracking, product/loyalty marketing and in-store product labelling. So we can say that QR code can be used in a variety of ways as per need. The main aim of using QR code is to give brief message to the users. There are several ways to use the QR code in Library environment.

- To give directions to the user
- To provide brief information to user
- To inform of required documents
- To promote the library services
- To create link to all the resources available in the library
- To create link to virtual tour of library sections
- To use in library exhibitions like Videos, Audios, and websites
- QR code is used to provide text messages for reference service and contact Information of library staff as well as library patrons.

VIII. ABOUT SHODHGANGA

"Shodhganga" is the name coined to denote digital repository of Indian Electronic Theses and Dissertations set-up by the INFLIBNET Centre. The word "Shodh" originates from Sanskrit and stands for research and discovery. The "Ganga" is the holiest, largest and longest of all rivers in Indian subcontinent. The Ganga is the symbol of India's age-long culture and civilisation, ever-changing, ever-flowing, ever-loved and revered by its people, and has held India's heart captive and drawn uncounted millions to her banks since the dawn of history. Shodhganga stands for the reservoir of Indian intellectual output stored in a repository hosted and maintained by the INFLIBNET Centre [4]. The Shodhganga@INFLIBNET is set-up using open source digital repository software called DSpace developed by MIT (Massachusetts Institute of Technology) in partnership between Hewlett-Packard (HP). The DSpace uses internationally

recognized protocols and interoperability standards. Shodhganga provides a platform for research scholars to deposit their Ph.D. theses and make it available to the entire scholarly community in open access. The repository has the ability to capture, index, store, disseminate and preserve ETDs (Electronic Theses and Dissertations) submitted by the researchers.

IX. CREATING QR CODE FOR BIOSCIENCE - THESES USING QR CODE GENERATOR

Here an attempt has been made to generate QR codes for theses submitted to Bioscience departments which are available in Shodhganga database with respect to Kuvempu University. For the present study the researcher selected Bioscience theses only due to time limit. A total of 297 theses related to Bioscience discipline have been selected for creating QR code. The following section explains the steps for creating QR code for theses using QR Code Generator.

a. Theses Collection of Kuvempu University@Shodhaganga

Kuvempu University is good in teaching, research and developmental activities. It has 36 departments. Every year good number of research projects/work has been undertaken by the different departments in the campus. The library of the university has rich collection of theses submitted by the research scholars. The theses submitted to the library have been uploaded to Shodhganga-a central repository of theses and dissertations at INFLIBNET. At present a total 1245 theses of all departments of Kuvempu University are available at Shodhaganga database. The researcher generated QR code for the Kuvempu University homepage at Shodhaganga.

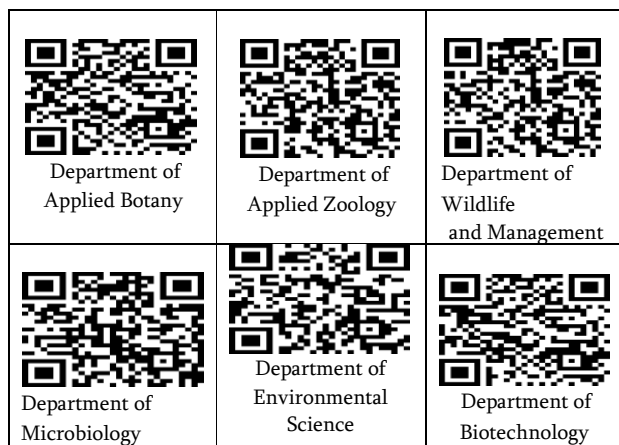Screenshot 1: QR Code for Kuvempu University homepage at Shodhaganga
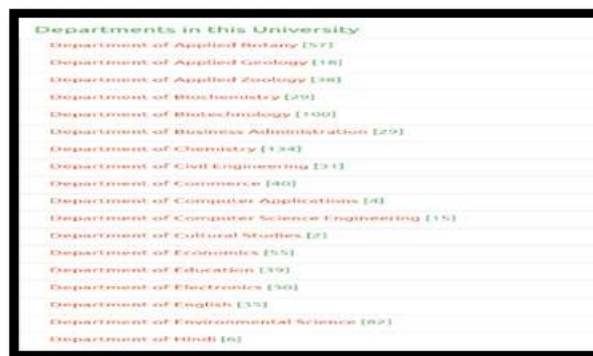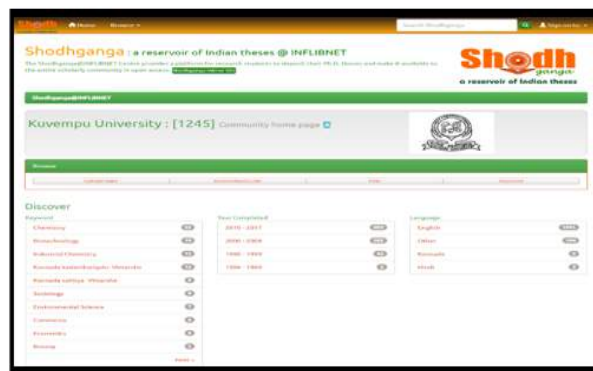
Screenshot 2: Output of QR Code for Kuvempu University homepage

The screenshot 1 is the QR code of Kuvempu University homepage at Shodhaganga. This QR code shows the total number of theses of Kuvempu University uploaded to the Shodhaganga repository. It also shows the number of theses available at Shodhagnaga by department wise as shown in the screenshot 2. One can view the department wise statistics of theses uploaded to the repository by scanning the above QR code using QR Code Scanner.

b. Department wise List of Theses of all bioscience departments

The present study covered theses of six departments under School of Bioscience.

Screenshot 3: QR Code for Department-wise List of Theses

Department of Applied Botany	Department of Applied Zoology	Department of Wildlife and Management
Department of Microbiology	Department of Environmental Science	Department of Biotechnology

Screenshot 4: QR Code for List of Theses of Department of Applied Botany

The above screenshot shows the departments come under School of Biosciences. The attempt has been made to generate QR code for all theses of Bioscience departments such as Department of Applied Botany(56), Department of Applied Zoology(37), Department of Wildlife and Management(5), Department of Microbiology(15), Department of Environmental Science(82), and Department of Biotechnology(100). A total of 295 theses have been covered under theses departments. When we scan the each QR code, we are able to see the number of theses available in each department.

c. Department of Applied Botany

Using QR Code Generator App, the researcher generated QR Code for link to theses of Department of Applied Botany.

By using QR Code Scanner App one can scan the above QR Code to see the number of theses uploaded to Shodhaganga database. It shows the number of theses sorted by upload date in descending order with minimum bibliographical details like uploaded date, Title of the research, name of the researcher and name of the guide as shown in below the Screenshot. Department of Applied Botany has 56 theses uploaded since 10- May-2018.

Screenshot 5: Theses Collection of Department of Applied Botany @ Shodhaganga
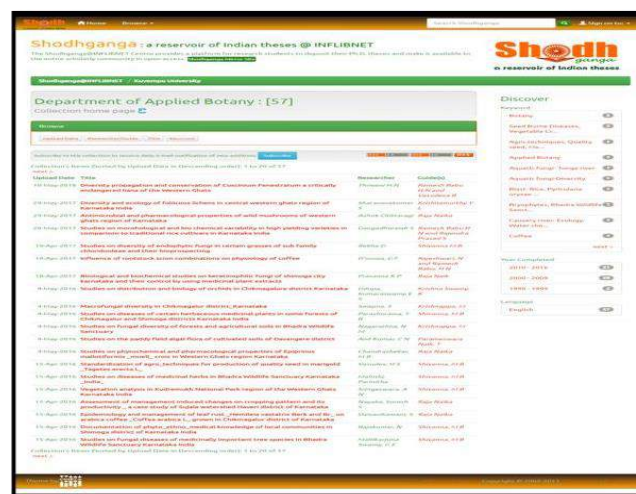
d. QR Code for Guide Wise List of Theses

QR Code for Researcher Guide helps to know about how many researches were done under particular guide. It helps to researcher to know the areas/ topics of the research carried out under the guide.

Screenshot 6: QR Code for Guide Wise List of Theses

Dr.Shivanna, MB

The above QR Code is related to the guide wise list of theses from Department of Applied Botany. Here, the researcher generated QR Code for Dr. Shivanna M.B. Simply scanning the above QR Code using smart device one can get the details of research work

carried out under the guide Dr. Shivanna, M B as shown in below figure.

Screenshot 7: QR Code for Guide Wise List of Theses

e. QR Code for Title

Every PhD thesis requires a title, and a good title can have a profound effect. The title is the very first part of the thesis to be read by research committee members and examiners, and it also serves as one of the primary ways in which researchers interested in the topic will be able to find the thesis in a library catalogue or online search, so the title should be as informative, engaging and elegant as possible. Usually the title search is the most popular search among the users. They can use a title search if they know the complete title of the work they are looking for. The completeness and order of words matter in a title search. Here, the researcher generated QR code for the title.

Screenshot 8: QR Code for Title

The screenshot 8 is the example of QR Code for title. Here the attempt has been made to show how title QR code will helpful to the researcher while searching for the complete bibliographical details. Here, one title has been taken to create QR code. By scanning this QR Code one can get complete bibliographical of the theses as shown in below figure.

Screenshot 9: Viewing Bibliographical Details of Title Using QR Code
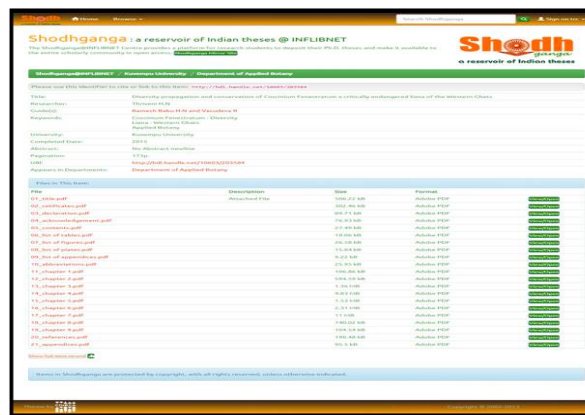
X. ADVANTAGES OF USE OF QR CODES IN LIBRARY

- It is always available free of cost in web;
- It can hold much more information than a regular barcode and can be used anywhere at any time;
- QR Code is user friendly technology and users do not need specific expertise for using this technology, only required smart phones
- like Android phone, iPhone, etc. with QR code scanner;
- It increase the users satisfaction and useful to achieve the fulfill library goals of Ranganathan fourth law i.e. save the time of reader;
- Anybody can generate the QR code using free software;
- It is used in promoting the library services like DDS, SDI and quick reference services etc.
- It helps human errorless when a person particularly search the web [5].

XI. CONCLUSION

QR Code is an innovative technology for the libraries helps to the information professional to

integrate bi-dimensional code composed of black and white pixels into a squared matrix, containing information to be enjoyed with the help of smart devices. A library user can easily get information regarding library collection, e-resource, library web site, Web-OPAC in a user-friendly environment. QR codes provide a flexibility and breadth of opportunities for providing such learning possibilities not available in other ways. Many libraries have already begun implementing services using these codes. Many QR code generator also available to generate QR Code for library collection, architecture design of library building, e- books, visiting cards, bookmarks, user manual or blog.

The present study helps researchers by providing quick access to bibliographical information about the theses. Kuvempu University Library can use these QR Codes to provide easy access to necessary information about the theses collection. Users do not need to memorize the

critical web addresses and they do not need to physically search the theses in the library. Use of this technology helps libraries to promote mobile based services and promote mobile learning environment. Libraries can use QR Codes in other areas like Web OPAC, CAS and Reference Services, etc. The present study, though small yet it is significant and would create awareness and impetus among the library professionals to highlight the issue so that more and more libraries could implement QR code- based services.

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Use and Impact Of Library Services On Users: A Case Study Of R R Institute Of Technology, Bangalore

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ABSTRACT

The purpose of this paper is examined to use and influence of library services on users. The students of R R Institute of Technology were the target group for the study whose views were taken into consideration with the help of questionnaires. 150 questionnaires were distributed to the students belonging to various undergraduate engineering departments to know their problems and suggestions about the library resources and services. It is found that 80 percent of the students are satisfied with circulation service. About 26.66 per cent of the students spend more than 7 hours in the library. 38 per cent of students expressed that their class work affect the usage of library whereas majority of them felt that not the class work do not influence the usage of library services as they have enough free time. This study reveals that 36.66 percent students utilise the library services daily. 45.33 percent of students are not satisfied with the organization of services and 20 percent of them expressed that the staff cooperation is poor.[1]

Keywords : User orientation, Reprographic service, Electronic services, Impact of Library services

I. INTRODUCTION

Library has been playing a vital role storing every event as it is managing resources apart from collecting the documents. The basic purpose of every library is to update and enhance services and to rise to the expectations and user satisfaction. He has to strive for library's integrated development, planning of library services and for the enrichment of existing collection. For the development of effective services, the librarian has to develop a strong communication channel with his users so as to maintain rapport with the Library users. Secondly, he has to monitor the quality services provided to the users. Continued monitoring of services would help the librarian to modify and re-study the concept of quality which is the primary aim of quality service.[2]

Library is a store house of knowledge and it has a dynamic role in academic curriculum. Library services can be effectively managed through mobilisation of resources. So resources and services are inter linked with each other. It is not of much use without service providers even if the resources are excellent. Students' achievements and success in various exams depend on excellent library support and its resources. The college library helps the faculty in their teaching and also helps the students in their academics and research work. Present library services have been greatly affected by the shift from print to electronic mode. Internet and World Wide Web brought about phenomenal changes in the

traditional library functions. The modern library has been constantly working satisfying the needs of its users in the web enabled environment. Present day users have to depend on the library's physical resources, but they have to seek information from the global computer networks. In order to satisfy the users, the library should transform itself either by subscribing to the resources or by developing electronic library services.[3]

II. R R INSTITUTE OF TECHNOLOGY A PROFILE

R R Institute of Technology, setup with a mission of imparting education to all sections of society, was established in the year 2008 to render highest standards of academic achievement with moral and social commitments. Converting the idea of providing high quality education combined with excellent infrastructure into a reality in Indian context. R R Institute of Technology have proved the capability of placing students after completing their course in prestigious organization across the country and aboard.

Generating a synergistic relationship with the industry with a long term view where the college and the industry could have a mutually beneficial relationship, it aims a rigorous, relevant and rewarding education with a special the emphasis on practical and technical inputs. Ideally located away from the huzzle and buzzle of Bangalore city. R R Institute of Technology, from where the data has been collect is a 12 years old institution imparting quality education affiliation approved by VTU and AICTE(Newdelhi). The college offers 6 UG Courses and 15 PG programmes. Around 560 students join in the college every year.

III. THE LIBRARY COLLECTION IN R R INSTITUTE OF TECHNOLOGY

Table -1: Library Resource in the Aurora Engineering College

Library resources	Numbers
Books	50000
SC/ ST Book Bank Books	500
Journals Bound volumes	1050
Journals	50
Magazines	20
Project reports	2500
CD-ROMs	1780
E- Journals	500
News papers	10
E- books	580
Handbooks	50

IV. OBJECTIVES OF THE STUDY

- To know the frequency of visit to the library
- To know which type of resources the students need
- To identify the type of services that need improvement
- To know the satisfaction of students towards the library services
- To identify the how effectively the library services are utilised

V. METHODOLOGY

170 questionnaires are distributed to students of all the branches of R R Institute of Technology as a part of this study. Out of 153 received 150 questionnaires are considered for this study as 3 of them are not completely answered. In all 150 questionnaires were taken for analysis of present study.

VI. LIMITATION OF STUDY

The study is limited to gathering the views of the undergraduate engineering students of R R Institute of Technology, Bangalore regarding the use of library resources.

VII. NEED FOR LIBRARY SERVICES IN ENGINEERING COLLEGE LIBRARIES

Unprecedented changes on the industry in the last few decades raised demand for engineering education. To fulfil the massive demand of youth, a mushrooming growth of institutions took place. AICTE has given permission only to those colleges which have satisfied its norms. The AICTE has formulated certain norms and every college has to go according to the norms. But currently the structure of library function with digital services in institutions is at pyramidal level with some leading institutions in the middle and the largest number at the bottom.[4]

So most of the users is rural Ares are unaware of the humungous library and even could not have heard about the digital service provided in library. Some colleges which are in second category are providing effective services to library but the students are not using updated services. The basic cause behind the scene can be the absence of effective librarian. An effective librarian is like a dictionary pocket. She/he has to establish a proper communication channel with users and improve services to satisfy library users. Likewise there are many obstacles and impediments in the effective usage of services and resources provided in library.[5]

Table – 2: Response of Students Branch wise

Sl.	Department	Distribution	Respondents	Percentage
1	EEE	25	23	17.82
2	ECE	25	22	17.05
3	ME	25	20	15.5
4	CSE	25	21	16.27
5	ISE	25	23	17.82
6	CIVIL	25	20	15.5

	Total	150	129	99.96

Table 2 exhibits the response of the student's branch wise. All the students are using library services. Among them 17.82% students belongs to EEE branch, 17.05% belongs to ECE branch, 15.5% students belongs to ME branch,16.27 are from CSE branch, 17.82 % are from ISE Branch and 15.5 % are from Civil Engineering.

Table –3: Number of hours spent of using Library services

Sl.	Time Spent	No of Respondents	Percentage
1	More than seven hours	40	26.66
2	6-5 hrs	60	40
3	5-3 hrs	40	26.66
4	Less than two hrs	10	6.66
	Total	150	100

Table 3 shows 40(26.66%) respondents spend more than seven hours in library, 60(40%) respondents spend 6- 5 hours in the library, 40(26.66) students responded saying theta they spend 5-3hours in the library. There are 10(6.66) respondents who spend less than 2 hours in the Library. It can be concluded that most of the students utilise library services for 5 to 6 hours.

Table – 4: Frequency of using Library services

Sl. No	Frequency	No of Respondents	Percentage
1	Daily	55	36.66
2	Alternate day	40	26.66
3	Twice in a week	32	21.33
4	Irregular	23	15.33
	Total	150	100

Table 4 shows that majority of students 55(36.66) visit the library daily, 40(26.66) students visit alternate days 32(21.33) of them twice in a week and remaining of them 23(15.33) visit the library irregular.

Table – 5: Type of resource used at Library

Resource Name	Respondents	Percentage
Text Books	70	46.66
Reference Books	30	20
Journals	15	10
Newspapers	45	30
Question Papers	30	20
E- Resources	52	34.66

This table shows that 70(46.66) percent of students come to the library for only text books , 52(34.66) of them use e- sources, 30(20) percent come to the library to read newspaper, 30(20) per cent of them use reference books, 15(10) percent of them use journals and 30(20) percent of them use question papers.

Table – 6: Effect of classwork on students' usage of Library

Responses	NO Respondents	Percentage
Yes	93	62
No	57	38
	150	100

It is clear from Table 6 that 62 percent of students expressed their view that the class work will not affect to use the library service whereas 38 percent of the students felt that the class work affect their visit to the library.

Table – 7: Satisfaction levels of students toward Library services

Service	Fully Satisfied	Partially Satisfied	Not Satisfied	Total
Circulation service	80(53.33)	20(13.33)	50(33.33)	150
Reference service	52(34.33)	40(26.66)	58(38.66)	150
Journals	55(36.66)	25(16.66)	70(46.66)	150
OPAC	80(53.33)	42(28)	28(18.66)	150
DELNET	51(34)	53(35.33)	46(30.66)	150
Reprographic service	70(46.66)	55(36.66)	25(16.66)	150
Digital Library service	40(26.66)	53(35.33)	57(38)	150
Online lectures	65(43.33)	25(16.66)	60(40)	150
General reading	20(13.33)	30(20)	100(66.66)	150

It is evident from Table 7 that 80 (53.33) per cent of the students are fully satisfied with the circulation service whereas 50(33) per cent are not satisfied and (20)13.33 percent is partially satisfied. About the reference services 58(38.66) per cent of students are not satisfied whereas 52(34.33) per cent are fully satisfied and 40(26.66) of the students are partially satisfied. Almost 70(46.66) per cent of the students are not satisfied with regard to Journals, 55(36.66) per cent are fully satisfied and remaining 25(16.66) per cent students are partially satisfied. Approximately 80(53.33) per cent of the students are satisfied with online public access catalogue, 42(28) per cent are partially satisfied and the remaining 28(18.66) per cent are not satisfied. Regarding DELNET Service 53(35.33) are partially satisfied, 51(34) students are fully satisfied and 46(30.66) students not satisfied. About the Reprographic service 70(46) are fully satisfied, 55(36.66) are partially satisfied and rest of students 25(16.66) are not satisfied. About the digital library service 57(38) per cent of the students are not satisfied and 53(35.33) per cent of them are partially satisfied and 40(26.66) per cent of them are fully satisfied. Majority of students 65(43.33) per cent are satisfied with online lectures, 60(40) per cent of them not satisfied and 25(16.66) per cent partially satisfied. 100(66.66) per cent students use the library for general reading and 30(20) per cent of them are partially satisfied remaining 20 (13.33) per cent are satisfied.

Table 8 - Impact of Digital services on students

Impact of digital services	Number of students	Percentage
Easier and faster	49	32.66
Accesses to current	60	40

information		
Access to wide range of information	41	27.33
Total	150	100

It is evident from Table 8 that 60(40) percent of the students used digital services, 49(32.66) per cent of the students access current information 41(27.33) percent of the students access to wide range of information.

Table- 9: Reasons for not using the services

Reason	Respondents	percentage
resources are not sufficiently	33	22
lack of awareness	35	23.33
lack of knowledge	35	23.33
lack of staff cooperation	23	15.33
lack of time	24	16

Table 9 shows that 35(23.33) students find some problems with lack of awareness, 5(23.33) percent students have problem with lack of knowledge. About 33(22) percent found the resources insufficient, 23(15.33) percent students complained lack of cooperation from the Library staff and 24(16) Percent students felt lack of time.

Table – 10: Opinion on Library Facilities

Sl. No	FACILITES	EXCELLENT	VERY GOOD	GOOD	SATISFA CTORY	NOT GOOD	
1	LIBRARY COLLECTION	40(26.66)	75(50)	15(10)	15(10)	5(3.33)	150
2	PHYSICAL FACILITIES	60(40)	48(32)	20(13.33)	5(3.33)	17(11.33)	150
3	ORGANIZATION OF COLLECTION	68(45.33)	39(26)	6(4)	33(22)	4(2.66)	150
4	STAFF COOPERATION	30(20)	45(30)	25(16.66)	34(33.66)	16(10.66)	150
5	LIBRARY SERVICES	41(27.33)	55(36.66)	25(16.66)	15(10)	14(9.33)	150
6	IT BASED SERVICES	43(28.66)	40(26.66)	41(27.33)	10(6.66)	16(10.66)	150

This table shows that library facilities with 75(50) percent of the students very good and 40(26.66) percent of them excellent. 15(10) percent of students feel good and 15(10) percent of the students feel satisfactory and remaining 5(3.33) percent students are not happy. Regarding physical facilities 60(40) percent of students find them excellent and 48(32) percent of the students felt very good, 20(13.33) percent students good, 17(11.33) percent students felt they are not good and remaining 5(3.33) percent students felt satisfactory.

About Organization of collection 68(45.33) students felt excellent, 39(26) percent of students felt very good, 33(22) percent students felt satisfactory and remaining students 4(2.66) percent felt that it is not good. Regarding staff cooperation 55(33.66) percent students felt satisfactory, 20(30) percent students felt very good, 20(30) percent of the students felt excellent and16 (10.66) students felt very good. Regarding library service 36.33 students felt very good, 27.33 percent of the students felt excellent, 25(16.66) percent students felt very good 15(10) percent felt not satisfactory and 14(9.33) of the students felt that the service is not good.

VIII. CONCLUSION

Based on the analysis of the data the following conclusions and suggestions are made to improve the user services in the R R Institute of Technology library.

About 26.66 per cent of the students spend more than 7 hours in library while 6.66 percent students use the library less than 2 hours. So user awareness programmes must be conducted every year to motivate the students towards utilising the services. The study reveals that 36.66 percent students use the library services daily while 21.33 per cent students use the services twice in a week. So good books and competitive books should be maintained. 62 per cent of them felt that the class work will not affect their use of the library and 38 percent felt that the class work affects the use of library. Therefore every day one hour has to be allotted to library in in the class timetable. Majority (46.66) of students use text books in the library while only 10 per cent use the journals. Teaching staff should be trained to make the students aware of using library for the latter's project works and motivate them to paper presentation in various colleges. 80 percent students satisfied with circulation service so text books collection should be increased. If the text books are increased it will help all the students to use the library for their needs. The study reveals the satisfaction levels on digital services. Students reveal the reasons for lack of usage of user services 23.33 percent felt that lack of awareness and

lack of knowledge. So students must be guided and trained. Library staff should provide user orientation programmes to the students presenting the existing library facilities and their utility. It is evident after analysis of table 8 that 60(40) percent of the students found digital services more important compared to print books Students feel that lack of time and lack of staff cooperation is prohibiting them from visiting the Library . So staff must be trained to help the students utilize the Library. 45.33 percent of students opined that organization of collection is excellent and Physical facilities are very important as well as resources. Student must feel comfortable if they stay in library. It will help to increase the users to come to the library to utilize the services.

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Green Library

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ABSTRACT

A Green Library also knows as a sustainable library, is a library build with environmental concerns in mind, Green libraries are a part of the larger green building movement. Green libraries are being build all over the world 'Go Green' has become a buzz word in the 21st century. Recently libraries too have imbibed this phenomenon enormously. Green Library Movement, which comprises of librarians, Libraries, cities, towns, college and university campuses committed to greening libraries and reducing their environmental impact. Constructing a green library building using performance standards like Leadership in Energy and Environment Design (LEED) and Indian Green Building Council (IGBC) is a way some libraries both abroad and in India are choosing to become green and sustainable. Environmental challenges like energy depletion and climate change will influence the type of information resources and programs libraries will provide to their communities. The present paper focus on the concept of 'Go Green Library' in general and 'Green Libraries' in particular. The attempt is also made to give information on different standards being followed, existing green libraries, practices and initiatives globally and locally.

Keywords : Go-Green, Green Libraries, LEED, IGBC, GRIHA Libraries, Library users, Surveys, Public libraries.

I. INTRODUCTION

'Go Green' or green library and 'Sustainability' are not the new concepts; they are the effort to save our mother earth. Recently due to the serious issues of global warming, depletion of natural resources and pollution in every walk of life, it have led to attention from the world wide community. Go Green is nothing but it's a set of practices to lead more environment friendly and ecologically responsible decisions and lifestyles which will protect our environment and its natural resources for current and future generations. Sustainability on

the other hand can be defined as the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs. It has economic, social and environmental aspect.

The Role of green library in this worldwide phenomenon is enormous. Libraries are considered to be the place for lifelong learning, and provide users with the knowledge. Librarians can act as role model for sustainability by providing suitable and relevant information related to green issues and concerns by its collection and designing various programmes with the users. There is no better place to model best practices for sustainable designing for reduced energy consumption and as an educator for a

whole range of new ideas than the library. Libraries apart from disseminating the idea of Green library and sustainability can lead by an example by modifying or designing new buildings to meet this ever increasing necessity for society.

II. MEANING OF GREEN LIBRARY

A green library is designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural solar and wind power energy, construction materials and biodegradable products, conservation of resources (water, energy, paper), and responsible waste disposal (recycling, etc.).

III. DEFINITION OF GREEN LIBRARY

The online Dictionary of Library and Information Science defines Green Libraries as: A Library designed to minimize negative impact on the natural environment and maximize indoor environment quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources (water, energy, paper, responsible waste, disposal, Recycling etc). In new constructing and library Renovation, sustainability is increasingly achieved through LEED (leadership in energy and environment Design) certification a Rating system developed and administered by the U.S. Green building council (USGBC).

Throughout this article the terms "green" and "sustainable" are used and need to be defined. In the Oxford English Dictionary (1989) the term "green" is defined as "pertaining to or supporting environmentalism" (p. 811). The term "sustainable" relates to "forms of human economic activity and culture that do not lead to environmental degradation, esp. avoiding the long-term depletion of natural resources" (Oxford English, 2008).

IV. OBJECTIVES

The objectives of this paper are:
1. To understand the meaning and importance of green libraries
2. To list the different standards being followed for green libraries
3. To gain insight into Eco-Friendly Libraries both abroad and in India
4. To find out solutions to convert existing libraries into green libraries.

V. RESEARCH METHODOLOGY

This research paper work can be characterized as a theoretical concept. The methodological framework used in this article is based on previous research related to systems of innovation. The approach of the research is exploratory in nature, which constitutes a secondary source. Literature review includes green building and green library techniques from United States of America (USA), Japan, and India etc. The Literature survey was done using online Computerized search engines like Google, Google scholar and same related journal etc. The research is based on secondary data, which includes compilation of research articles. This Research paper is more of informative and suggestive in nature, many more studies and work need to be done by the individuals, institutions and organizations working for green libraries.

VI. PURPOSE OF PROMOTING GREEN LIBRARY

The purpose of this green library concept paper is to introduce the planning and architectural design features, and the post-occupancy evaluation (POE) of the Public Library in Karnataka Public Library System. This paper also proposes possible solutions in response to the public's suggestions for improvements.

There are some major impotence of Green Library, they are

7.1. Green library does not require any high budget allocation. It is now possible for libraries to build green buildings on conventional budgets.

7.2. Green libraries make use of finite energy resources which is readily available and also fit into the library budgets. Here technology does not become a barrier.

7.3. The Maintenance of green libraries is also as natural ventilation, aeration creates a good environment .There is no necessity for artificial creation and in turn use of extra energy for maintenance.

7.4. As Green libraries play a paramount role towards the welfare of mankind, this could be used as a part of the marketing strategy of the library as a

socially responsible body which can have a big impact on the library's image.

VII. COMPONENTS OF GREEN LIBRARY

There are some major components in green library they are:

8.1. Site Location
8.2. Water Conservation
8.3. Energy Efficiency
8.4. Material and Resources
8.5. Indoor air quality
8.6. Innovation and design process
8.7. Environment friendly or Eco friendly
8.8. Innovative and creative
8.9. Resource saving
8.10. Comfortable and health
8.11. Full of humanistic concern.

8.1. Site Location:

This is the most important element in the green library. Selection of the site has a large impact on how ecologically friendly the library will be .LEED has given lots of guidelines for site selection process .The Library should be located in a heavily populated area and people should be able to reach the building via public transportation. There should be simple environmental parking lots with natural

shading /Green Roofs to reduce the heat effect. Walking and biking are the green

Ways to travel so library can prepare attractive and comfortable walking and biking paths to get into the library.

8.2. Water Conservation

Libraries should plan efficient water conservation strategies like to capture and conserve rain water to be used in irrigation of landscape around the buildings. Urinals can be planned in such a way where waterless urinals may be used.

8.3. Energy Efficiency

According to LEED energy efficiency is the heaviest weighted of all the categories .With the advent of new technologies in the 21st century, it is quite possible to generate energy from the natural

resources. Energy conservation can do through passive and active strategy. Passive strategies could be based on sun and wind energy. Active strategies include using more advanced technology driven strategies converting solar energy into energy resources and sensors readjust lighting.

8.4. Building Materials

The Building materials should be selected based on

a.) The material should contribute to a less waste as possible like post-industrial and postconsumer recycled materials.

b.) The material selected should not cause much damage to the natural environment. It should be possible to reuse and recycle.

8.5. Indoor air quality

Most Modern Buildings are temperature controlled and air-tight. The lack of ventilation make buildings expensive to cool, it also trap harmful toxins which can do serious damage to people's respiratory system. Green buildings need to be designed in a way in which the air gets recycled and does not stay stagnant. A green library is not just about caring the

external environment but also safeguarding the health and well- being of those who work in it.

VIII. ELEMENTS OF GREEN LIBRARIES

The main goal of green building is to develop and use sustainable energy efficient resources in construction, maintenance and overall life of the structure. Libraries considering green design will often look at the leadership in energy and environment designing (LEED) rating system. Brown identified the following green designing elements, which can be incorporated into libraries.

9.1.   Community collaborating makes sure that community assets are efficiently used and helps to maintain public support.

9.2.   Daylight pair daylight with artificial lighting and reduce energy costs.

9.3.   Green materials use renewable materials like wood, bam boo.

9.4.   Green roofs 9.5.Raised floor systems

9.6.   Energy efficiency

9.7.   Natural Ventilation

9.8.   Green power and renewable energy

9.9.   Indoor environment quality.

IX. SOME MODELS OF GREEN LIBRARY BUILDINGS

Fig -1. Some Models of Green library buildings - wooden architecture integrating the library into the surrounding ecological environment at ground base.

X. WHY? AND HOW ARE LIBRARIES BECOMING GREEN?

There are several reasons why libraries should build green or incorporate green features into their buildings;

11.1.   Green library does not require any high budget allocation. It is now possible for libraries to build green buildings on conventional budgets.

11.2.   Green libraries make use of finite energy resources which is readily available and also fit into the library budgets. Here technology does not become a barrier.

11.3.   The Maintenance of green libraries is also as natural ventilation, aeration creates a good environment .There is no necessity for artificial creation and in turn use of extra energy for maintenance.

11.4.   As Green libraries play a paramount role towards the welfare of mankind, this could be used as a part of the marketing strategy of the library as a socially responsible body which can have a big impact on the library's image.

XI. IMPLEMENTATION OF GREEN LIBRARY OR SOLUTIONS FOR THE EXISTING LIBRARIES TO GO GREEN

The existing libraries can also implement eco-friendly measures in their day-to-day routines like:

12.1. Management of waste by using most modern waste segregation and recycling practices like waste can be turned into compost which can be used to increase the green cover in the surrounding area like Orchid Ecotel in Mumbai is the best example of waste management.

12.2. Use of CFL or LED lights instead of tube lights with proper maintenance can minimize expenses.

12.3. Rain water harvesting pits can be created to store water and then it can be used for gardening.

12.4. Use of Maximum Natural light and wind can save electricity.

12.5. Digitization and Scanning of rare books etc. can be done to save paper.

12.6. Use of e-books and journals to save paper and place.

12.7. Eco friendly pesticides can be used at the time of pest-control.

12.8. Use of eco-friendly paints on the wall to reflect more light

12.9. Eco friendly material can be used for stacking purpose.

12.10. Turning off lights and Fans in the library when not required.

12.11. Using network printer instead of personal printers.

12.12. Installing a new server and running multiple servers on one server box.

12.13. Re-fill toner cartridges instead of buying new.

12.14. Putting computers in sleep mode when in not use.

12.15. Use one side paper to taking Xerox or rought and paper clipping etc.

In India the pace of green movement in general and in libraries is slow. Statutory Bodies like UGC, AICTE etc. can play a major role by making it mandatory for colleges to incorporate green features in their buildings and libraries. Government and Universities too should make all the efforts to transform whenever possible libraries into green libraries.

XII.   REASON OF MAKING GREEN LIBRARY (WHY?)

There are several reasons of why libraries should build green or incorporate green features into their buildings,

13.1. Green library does not require any high budget allocation. It is now possible for libraries to build green buildings on conventional budgets.

13.2. Green libraries make use of finite energy resources which is readily available and also fit into the library budgets. Here technology does not become a barrier.

13.3. The Maintenance of green libraries is also as natural ventilation, aeration creates a good environment .There is no necessity for artificial creation and in turn use of extra energy for maintenance.

13.4. As Green libraries play a paramount role towards the welfare of mankind, this could be used as a part of the marketing strategy of the library as a socially responsible body which can have a big impact on the library's image.

XIII.   WHAT ARE GREEN LIBRARIES?

When librarians talk about green libraries what usually comes to mind are green library buildings. At the event architects, city planners, and librarians shared the latest developments and cutting- edge solutions being adopted in green library buildings (Library Journal, 2007). Green buildings are measured according to a rating system like the LEED (Leadership in Energy and Environmental Design) certification system, which was developed by the U.S. Green Building Council. Since the introduction of LEED in 2000, it has become the U.S. national standard for commercial and institutional buildings (U.S. Green, 2008). LEED is considered a performance standard, which means it allows a building owner or planner to choose how to meet certain benchmark numbers without prescribing specific measures. It is a point based system   in which projects earn LEED points for meeting green building criteria. The six credit categories for new building construction are sustainable sites, water efficiency, and energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design (U.S. Green). There are currently six types of building certification under LEED including LEED for New Construction (LEED-NC), LEED for Commercial Interiors (LEED-CI), LEED for Core and Shell (LEED-CS), LEED for Existing Buildings (LEED-EB), LEED for Neighborhood Development (LEED-ND), and LEED for Homes (LEED-H) (Yudelson, 2007). The LEED

rating system is progressive with four levels of certification: Certified, Silver, Gold and Platinum. Each certification level has 32 categories of environmental design and energy concerns for a maximum point value of 69. Buildings must score a minimum number of points

above "standard building" performance levels to qualify for certification (Yudelson, 2007). For example, a basic LEED-NC certified building must score at least 26 points in the six credit categories. To certify for a Silver rating, a building would require

33 points, for Gold 39 points, and for Platinum rating a minimum of 52 points (Yudelson, 2007). Platinum certification is difficult to achieve. In 2006 there were fewer than 20 Platinum LEED-NC projects. The Barrington Area Library set a goal of being the first public library in Illinois to receive Platinum certification (Barrington, 2008). Unfortunately due to the economic downturn on November 4, 2008, Barrington Area citizens voted against the $34.3 million bond issue to fund the Library Improvement Plan (Doyle, 2008). Currently in the US there are only two LEED-certified Platinum library buildings: the William J. Clinton Presidential Library Antonelli: The Green Library Movement: An Overview and Beyond in Little Rock, Arkansas, and the Lake View Terrace Branch Library, part of the Los Angeles Public Library District. The Clinton Presidential Library originally received Silver Certification under the USGBC's LEED-NC program. In 2007, the Library achieved LEED-EB Platinum certification by adding additional green cleaning and recycling programs, climate- neutral and energy efficiency strategies, water wise landscaping

and a green roof (Pilloton, 2007). The Platinum certified Lake View Terrace Branch Library opened in 2003. Some of the Library's green features include: natural day lighting, shading to filter direct sunlight, solar panels, sensors that control indoor lighting for improved energy efficiency, and bamboo wood flooring. The Library is located close to electric car charging stations and mass transit. It also offers a bike rack and a horse-hitching post (Los Angeles Public, 2005). The push to build green libraries continues to grow. In 2008 Massachusetts cities were offered $5 million to build or renovate green libraries. The State Board of Library Commissioners plans to award construction grants to 31 Massachusetts cities and towns. The selected

libraries must follow LEED design standards to qualify for the grant money (Crimaldi, 2008). Chicago, Illinois, is clearly the leader in green library building. Chicago prides itself on being one of the first cities to incorporate environmentally friendly practices into public buildings. The city has even created its own building standard known as The Chicago Standard, which is based on selected points from the LEED Green Building Rating System. Beginning in 2002 the city of Chicago decided to use green building technologies in the construction of municipal buildings such as libraries and police stations. The first green library, Budlong Woods Library, opened in spring 2003, followed by the West Englewood Library in the summer 2003, and the Oriole Park Library in spring 2004 (City of Chicago, 2004). By December 2007 seven Chicago branch libraries had received certification with more planned.

XIV. GREEN LIBRARY PROGRAM IN INDIA

Anna centenary library located in Kotturpuram Channai is the largest library in South Asia and one of the most sustainable. The cavernous space built on 8 acres of land can accommodate well over a thousand readers at a time and 1.5 million books. The designed by C.R. Narayana Rao makes the most of the outdoor light with lots of windows to the northeast, skylight and an outdoor amphitheater on the roof. Inside LED lights illuminate a huge indoor auditorium, cafeteria and many reading and research area. The library was build from the ground up with conservation in mind. Special care was taken to select sustainable materials more than 60% are locally sourced and recyclable. Natural lighting is

key player in the design, as are large windows facing the north and east to provide the best light without introducing heat. The south utilizes shading and vegetation to create heat buffer zones. Waste water is reused on the grounds and naturally educational materials are placed throughout the space to raise awareness of how the building works.

Anna centenary library have some Sections, they are:

- Own Book Reading Section
- Children's Section
- Periodicals Section
- Tamil Books Section
- English Book Section.

The average number of persons who visited the library between January and October 2011 is around 26,500, compared to the monthly average of 20,000 in 2010

The Librarians all around the country are climbing aboard the green library band wagon by offering green library programs. On May 24, 2007, James LaRue, author of the 1991 article "Green Librarianship" and Director of the Philip S. Miller Library in Castle Rock, Colorado hosted the free public seminar "Building Green trends and opportunities in Douglas County." A panel of local facilities and energy managers were assembled to talk about green projects currently being developed in Douglas County, and to brainstorm on green projects they would like to create (LaRue, 2007). The METRO (Metropolitan New York Library Council) Green Librarianship Special Interest Group (SIG) held its first meeting on November 1, 2007. The well attended meeting was organized by Brita Services, Undergraduate Services Librarian at the New School, and Rita Ormsby, Information Services Librarian at Baruch College's Newman Library. The creation of the SIG came out of a Green Libraries discussion held at the August 2007 Library Camp at Baruch College (Metro Collaborate, 2008b). The SIG was developed for librarians and staff members interested in adopting best green practices such as recycling in libraries, and providing resources and information on green living and green working to the wider library communities (Metro Collaborate, 2008a).

XV. CONCLUSION

The library is to serve its community. The Libraries must respond to this increasing focus on Green Movement and should act as role models for sustainability by providing suitable and relevant information related to green issues and concerns. Librarians should encourage and support the movement of green libraries and help communities to understand green and sustainable concepts. More and More eco-friendly solutions should be implemented to make our mother earth a better place to live in.

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Citation Analysis of Grey literature reflected in Ph.D Thesis submitted to Visvesvaraya Technology University Belagavi.

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ABSTRACT

This Study made an attempt to analyse, the citations reflected inPh. D Theses submitted to Visvesvaraya Technological University, Belagavi, analysed for citing Grey Literature and Grey Literature form and subject wise distribution of articles cited from periodicals, Frequency and percentage distributions and measures of central tendency used to analyse data, and authorship pattern. Findings replicate that, Grey Literature is the most utilized reference material in the Theses, such as, Engineering and Technology, library science, in general, had the highest number of theses Submitted in the year 2014, with 136 and lowest number of thesessubmitted in the year 2009, with 23. The findings from this study could serve as a user study with implications for collection, development and user services designing in libraries.

Keywords : Citation Analysis, Grey Literature, Library and Information Science, Ph. D.Theses, VTU

I. INTRODUCTION

Analysis of data is the penultimate step in research process. It is the link between raw data and significant results leading to conclusions. This process of analysis has to be result oriented. In other words, it must aim at setting objectives and hypotheses. According to richardbudd, analysis leads eventually to summarizing procedures resulting in some sacrifice of details. Frequencies and column inches are summarized in tables as averages and percentages are transformed into guides or attention scores to be used as a single variable in summarizing the data. What is gained is, of course, more valuable. For the analyst in reality, has lost nothing by summarizing his quantification procedures. He has traded some unmanageable data for manageable information; he has exchanged his individual data for general answer, efficiency and scientific rigor. Thus, analysis is a process of summarizing or transforming raw data into useful information.

Citation studies attempt to study the characteristics of subject literature. The investigations of such kind of studies are found to be useful to manage the information resources and services in libraries and information centres.

In this chapter an attempt is made to study the characteristics of literature cited by research scholars in their PhD theses submitted to the Universities in Visvesvaraya Technology UniversityBelagavi. The results and discussions with regard to bibliographic form, Conference, Research reports, Workshop and

countrywise, subjectwise, authorship pattern and ranking of Theses which is another way, presented in different Tables and Figures.

II. REVIEW OF LITERATURE

Previous studies are the backbone for upcoming researchers but hardly research attempt have made on the topic grey literature, hence those studies have been considered for this paper.

VenugopalHajje and K. R. Mulla (2018).Made an effort to analyse the citations in Master's degree dissertations submitted to the Department of Library and Information Science, Rani ChannammaUniversity, Belagavi during the period 2012-13 to 2015-16, analysed for citing Grey Literature and Grey Literature forms. Frequency and percentage distributions(presented in charts, tables) and measures of central tendency were used to analyze data. Result shows that Grey Literature was the most utilized reference materials in the dissertations. Also, library science, ingeneral, had the highest number of Grey Literature cited in the year 2016,237(26.99%) and lowest number of Grey Literature cited in the year 2012-2013, 207(23.57%). Ramesh Kuri and VenugopalHajje (2014).made an effort to analyse the citations cited in the "Pearl" Journal during 2009-2011. This analysis has been taken through the various analysis techniques such as Authorship pattern, Domain wise distribution of citations, Age of citations, most prominent journals cited and different sources of citations etc. At the end the study is concluded with some recommendations.

III. WHAT IS GREY LITERATURE?

- Grey literature is any material that has not been formally published by a commercial publisher. If you can buy it in a bookshop, it is probably not grey literature; it does not appear in books or journals.

- The term grey literature refers to research that is either unpublished or has been published in non-commercial form.
- In-house Publications are called as Grey Literature.

IV. TYPES OF GREY LITERATURE

Conference Papers, Blogs, Newsletters, Memoranda, Policy Statements, Bulletins, News Paper Clippings, Photographs, Emails, Statistics, Patents, Fact Sheets, Course Materials, Annual Reports, Posters, Legislation, Personal Communication, Pamphlets, Questionnaires, Thesis and Dissertations, Lectures, Book Chapters, Interviews, Government Documents, Press Releases, Physiological Specimens, Bibliographies, Essays, Speeches, etc.

V. STATEMENT OF THE PROBLEM

The present study deals with the citations replicated in the Ph.D Theses which submitted to the VTU thus this study entitled as "Citation Analysis of Grey Literature Reflected in PhD Thesis Submitted to the Visvesvaraya Technological University, Belagavi"

VI. OBJECTIVES OF THE STUDY

The specific objectives of the present study are to know.
- Total number of Thesis submitted to the university;
- Total number of grey literature cited by the authors;
- How many authors cited Grey Literature in their Thesis;
- Citation as appeared in the Thesis.

VII. SCOPE AND LIMITATIONS OF THE STUDY

Citation analysis of grey literature like any other study is not free from criticism. The following are some of the limitations of this study.

- The study is confined to thesis submitted to Visvesvaraya Technological University,Belagavi.
- The study is confined to only available theses in the VTU, University.
- The study is completely confined to the documentary.
- The study is confined to 10 years (2008 to 2017).

VIII. METHODOLOGY

The present study is concerned with the grey literature sources and began with the extensive literature search relating to grey literature referred in Ph.D theses. The study area covers all the Theses submitted to Visvesvaraya Technological University, Belagavi in the year 2008 to 2017. Based on the list collected from evaluation department the researcher searched these PhD theses in department and library. If theses not available in library the researcher consulted respective student or guide. The bibliography and references part were photo copied for detailed study. Total 778 numbers of available theses were taken for this study.

IX. DATA ANALYSES AND INTERPRETATION

Table-1 Year Wise Submission of Theses

Year Wise Submission of Theses

S.L No	Year	Available Theses
1	2008	31
2	2009	23
3	2010	42
4	2011	72
5	2012	82
6	2013	94
7	2014	136
8	2015	110
9	2016	129
10	2017	59
Total		778

The table number 1 shows that year wise submission of Theses to Visvesvaraya Technological UniversityUniversity, Belagavi, in the period of Ten years from 2008 to 2017. In 2008,31 Theses were submitted to the University likewise 2009-23, 2010-42,2011-72,2012- 82,2013-94,2014-136,2015-110,2016-129 and 2017-59 each and it showing in Fig-1.

Fig-1: Year wise Submittion of Theses
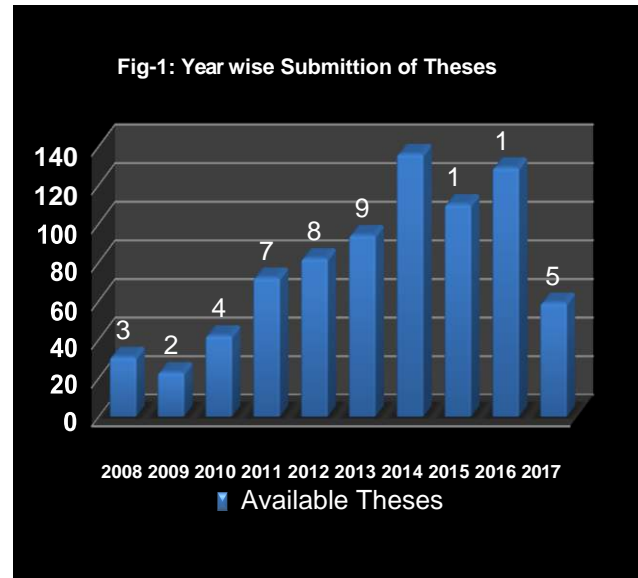
Table-2: Subject Wise and Data Type wise distribution of citations

Sl.No	Subject	Conf.	Thesis	Reports	Workshop	News paper	Seminar	weblink	Total Cit.	%
1	Chemistry	98	80	20	13	12	4	4	231	7.08
2	Civil Engineering	194	134	32	6	13	13	11	403	12.4
3	Computer and Information science	366	132	17	48	11	5	5	584	17.9
4	Electrical and electronics eng.	259	157	19	53	11	0	40	539	16.5
5	Mechanical Engineering	232	208	19	15	16	9	17	516	15.8
6	Technology	74	34	8	11	6	1	18	152	4.66
7	Physics	84	41	10	11	9	4	10	169	5.18
8	Mathematics	52	61	8	7	10	5	8	151	4.63
9	Biotechnology	58	30	14	10	5	2	2	121	3.71
10	Electrical Communication	24	15	12	7	5	1	1	65	1.99
11	Chemical Engineering	24	4	2	2	1	1	6	40	1.22
12	Environmental Engineering	14	2	5	2	8	2	1	34	1.04
13	Industrial and Production Engineering	36	4	14	2	2	1	6	65	1.99
14	Information & Science Engineering	12	1	2	2	6	3	4	30	0.92
15	Instrumentation Technology	18	3	5	1	3	3	4	37	1.13
16	Polymer Science and Technology	13	2	1	4	1	3	2	26	0.79
17	Telecommunication Engineering	16	2	9	6	1	2	2	38	1.16
18	Textile Technology Engineering	32	5	12	6	1	1	2	59	1.8
	Total	1606	915	209	206	121	60	143	3260	100
		49.3	28.06	6.41	6.31	3.71	1.84	4.38		

The Table no. 2, demonstratesthat 3260 citations cited in 1085 theses in engineering and technology are scattered primarily over 18 subjects. Out of total citations, 3260 citations are representing nearly 82% of the total are concentrated in five subjects, i.e. Chemistry, Civil Engineering, Computer and Information science, Electrical and electronics eng., Mechanical Engineering, Technology, Physics, Mathematics, Biotechnology, Electrical Communication, Chemical Engineering, Environmental Engineering, Industrial and

Production Engineering, Information & Science Engineering, Instrumentation Technology, Polymer Science and

Technology, Telecommunication Engineering, Textile Technology Engineering. They represent 17.91 %, 16.53 %, 15.82 %, 12.36 % and 7.09 % respectively of the total number of citations. Lagging much behind, next in order are citations relating to Chemical engineering, Biotechnology, Physics and Mathematics. They represent 1.23 %, 3.71 %, 5.18 % and 2.05 % respectively of the total citations. Citations relating to, Biochemical Engineering, Medicine and Bioscience together which represent 5.22 % of the total citations. Other subjects such as Polymer Science and Technology, Telecommunication Engineering, Textile Technology Engineering etc.

Table-3: Authorship Pattern

| Year | Number of Authors | | | | | | | | | | | Total |
	1	2	3	4	5	6	7	8	9	10	More than 10Auther	
2008	127	70	32	10	4	4	1	1	1	0	30	280
2009	121	69	33	23	8	2	1	2	0	2	13	274
2010	119	45	36	17	2	2	0	0	0	0	2	223
2011	154	101	73	15	13	4	0	0	0	0	4	364
2012	182	115	72	18	7	2	0	1	0	0	1	398
2013	219	97	48	20	5	1	0	0	0	0	11	401
2014	244	72	43	10	2	1	0	1	0	0	15	388
2015	227	57	69	23	2	1	0	0	0	0	10	389
2016	198	52	40	12	3	1	2	0	0	0	12	320
2017	122	40	33	10	3	1	2	0	0	0	12	223
Total	1713	718	479	158	49	19	6	5	1	2	110	3260
%	52.54	22.02	14.69	4.84	1.50	0.58	0.18	0.15	0.03	0.06	100%	

Collaborative research is very much a feature of the library and information science especially during the 21st century. It is a natural reflection of complexity, scale and costs of modern investigations in library and information science. Multi authorship provides different measures of collaboration in the subject. Table reveals the authorship pattern of the articles published during the period of study. Maximum numbers of Theses were contributed by two authors 215 (35.71%). This is followed by three authors with 189 (31.39%) articles, four authors contributed 113 articles (18.78%) and five and more authors contributed 47 (7.81%) of the total articles. The single author is contributed 38 (6.31%) of the total theses.

Table-4: Year Wise Authorship Pattern

| Author | Year | | | | | | | | | | Total | % |
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
Single	127	121	119	154	182	219	244	227	198	122	1713	52.54
Joint	718	479	158	49	19	6	5	1	2	110	1547	48.58
Total	825	580	257	183	181	205	229	208	140	175	3260	100%

Degree of collaboration in the Indian Journal of Agricultural Research

The formula given by K. Subramanyam is useful for determining the degree of collaboration in quantitative terms. The study followed the same formula which is mathematically put as:

$$C = \frac{MN}{MN+NS}$$

Where C = Degree of Collaboration

NM= Number of Multi author

NS= Number of Single author

In the present study

NM=1547

NS= 1713

$$C = \frac{1547}{1547 + 1713} = 0.519$$

X. FINDINGS & SUGGESTION

Followings are the major findings of this study:-

- Maximum numbers of Theses were contributed by two authors 215 (35.71%).
- 3260 citations cited in 1085 theses in engineering and technology are scattered primarily over 18 subjects.
- Yearwise submission of Theses to Visvesvaraya Technological UniversityUniversity, Belagavi, in the period of Ten years from 2008 to 2017.

Hence grey literature need to be highlighted because many researchers neglected these kind of sources.

XI. CONCLUSION

The Resource management is the efficient and effective operations of an organization's resources when they are needed. This kind of citation analysis study will definitely help the librarians to understand information needs, use of pattern and use of various resources of research scholars and accordingly selection of useful resources as there is

an explosion of information and documents in various formats.

This study helps to know how many authors were cited Grey Literature for their research publications especially Ph. D. Theses, and it also emphasis on the usefulness of grey literature in the research and development activities.

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Workaholism : A review

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ABSTRACT

The term workaholism was coined in 1971 by minister and psychologist Wayne Oates, who described workaholism as "The compulsion or the uncontrollable need to work incessantly" (Oates, 1971). From that time onwards, research on workaholism has been implemented by disagreements surrounding how to define and measure the concept. However there still lies a little confusion between workaholics and hard workers. The paper focuses on the understanding the fine line between workaholics and Hard workers. The researcher by referring various reviews has tried to explain the personality of both of the above. The paper also talks about the pros and cons associated with workaholism. Intense work of various researchers has been referred while the formation of this paper. Interestingly, while work hours and workaholism often go hand in hand, it has been seen that not all people who work long hours can be called as workaholics, and not all workaholics will work for long hours. However work will be there in the mind of a workaholic wherever he /she is irrespective of with whom he / she is

Key Words: Workaholism, productivity, Hard Worker, Human resource management

I. INTRODUCTION

The term "workaholic" is often used for a hard worker. Some people seem to take pride in identifying themselves as a person consumed by their work. But is it really a good thing? Workaholism can be described as work addiction. Due to the introduction of technology, it is possible for people to work anywhere anytime without any physical presence. "The resulting pressure for 24/7 connectivity may push more and more people into putting work ahead of all other activities. Although this may at first seem to benefit the companies for which they work, offsetting issues negatively impact business operations."

https://www.sciencedaily.com/terms/workaholic.htm

The term workaholism was coined in 1971 by minister and psychologist Wayne Oates, who described workaholism as "The compulsion or the uncontrollable need to work incessantly" (Oates, 1971). From that time onwards, research on workaholism has been implemented by disagreements surrounding how to define and measure the concept. For example, it has been defined as an addiction to work by Ng, Sorensen & Feldman, 2007; Porter, 2006; Robinson, 2000), Few call it a "syndrome comprised of high drive, high work involvement and low work enjoyment" (Aziz &Zickar, 2006).

Malissa Clark in her article in the science of work has also given a brief taxonomy of workaholism. According to her the causes of work are:

1. Motivation: Workaholics are different from people who are simply highly engaged in their jobs. They don't enjoy their work; they feel compelled to work because of internal pressures. There lies a high level of motivation in them which drives them to work

2. Cognitive: Workaholics have insistent thoughts about work when they're not working, and they find it difficult to mentally disengage from work.

3. Emotional: Workaholics are emotionally attached to their work and hence they are emotionally obliged to work. Workaholics experience negative emotions like anxiety and guilt when they aren't working.

4. Behavioral: Since they are attached to their work to a high extent and they also feel obliged towards their work organization, they tend to work beyond what is reasonably expected of them by their organization.

Economic pressure, advances in technology, downsizing the workforce – all contribute to the behaviour of workaholism. (Leah Larkin 2008) True workaholism is an obsessive-compulsive disorder which can lead to serious health problems. Larkin in his study has associated workaholism with a medical condition.

II. REVIEW OF LITERATURE

A. Myths about Workaholism

Malissa Clark (2016) "A misconception is that if you love your job, you must be a workaholic. In fact however people who have high work engagement–a positive, fulfilling, work-related state of mind–are probably not workaholics." Because, workers who are engaged are driven to work because they find it pleasurable and they really enjoy it, on the other hand workaholics are driven to work because they feel an inner compulsion to do so.

Work addiction/workaholism is a manifestation of excessive work that carries with it a number of consequences to both the individual and that person's network of relationships both personal and professional

As per a post in "CareerCast" Researchers have found that there are many people who can be called as workaholics, but have few of the emotional problems associated with workaholism. The term enthusiastic workaholics is used to describe workaholics without health problems who learn the requirements of a job quickly, excel at their work, put great amounts of time into the job and reap the rewards for their work-related efforts. Non-enthusiastic workaholics are those who do have health risks and put a great deal of time into work, but get none of the rewards in return. Many of these people work at companies that lack systems of rewarding exceptional work, or have an internal bias against certain types of workers. (Published on http://www.careercast.com)

As per a Wharton article- The Truth About Being a Workaholic: Why It Isn't Always Bad for You, "What's more, the researchers found that simply working long hours alone didn't lead to poor health. In fact, employees who worked long hours but were able to mentally "recharge" overnight were not putting their health at risk. But those who worked long hours and also had a compulsive work mentality significantly increased their risk of developing metabolic syndrome."

When work becomes all consuming and joyless it becomes a negative addiction. Workaholics work because they have nothing else to take its place. Their work addiction is a recurring obsession, and typically joyless. Simply labellingoneself "workaholics" just for putting in a few extra hours per week does not justifies true meaning of 'Workaholism'. In reality because of this poor economy, many of these people are working extra hard just to keep their jobs. Real workaholics have few (if any) outside interests. They let their family lives fall apart. They often have health problems and suffer from depression and deep insecurities. Like

any addiction, they repeat destructive behaviors despite knowing that they're destructive. Many would like to stop, but find it difficult or impossible to do so. (Source: careercast.com)

In the article by Wharton, the three sides of workaholism are beautifully described as follows:

1.   The Bad: They call it as 'Careerism'. Careerism is all about being focused on one's career at the expense of one's health and personal life also

2.   The Ugly: Called as 'Denial'. The ugly side of any addiction is denial. When compared to non-workaholics, it is found that workaholics are more likely to believe that a workaholism is same as hard working. It is also seen that most of the workaholics believe that it is a good thing to be a workaholic. Which shows they are in a state of denial

3.   The Good: Commitment. A good thing about workaholism is that workaholics are committed to their work. When compared to non-workaholics, workaholics are more dedicated to their careers and they believe that their careers are the most important aspect of their lives. Below is a graph that reflects a difference between a workaholic and a non workaholic

Source:https://www.quantumworkplace.com
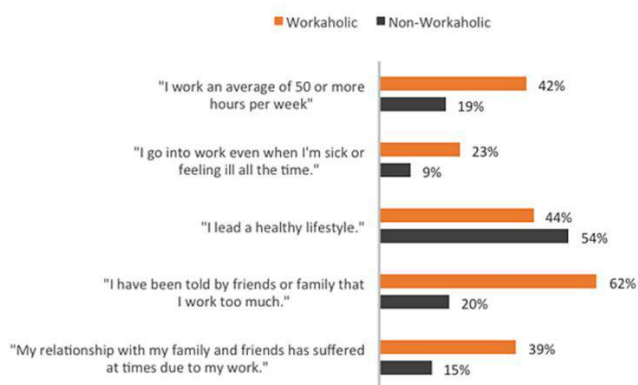
Dedicated employees are important assets within any organization, and this aspect of workaholism is the one that organizations rely on most frequently. This "good" side of workaholism is largely incidental because intense commitment is a natural symptom of people who live to work. The idea that work is the most important aspect of life, in particular, taps into

careerism, which is an especially troublesome aspect of workaholism.

B. Workaholics and Hard Workers

Many people confuse hard-working people with workaholics. Workaholism means that you value work over any other activity, even when it negatively affects the health and family, as well as the quality of the work. On the other hand, there are many people who put in long hours, but still give back to their loved ones and enjoy outside activities when they have free time. These people are hard workers, not workaholics. There is a very serious distinction between the two.

Today because of technology nature of the workplace is Dynamic than ever before to understand the antecedents and consequences of workaholism. Technology advances (e.g., smartphones, company-supplied laptops) have allowed employees an unlimited access to their work, and changes in where work occurs (e.g., telecommuting) may further blur the lines between work and home. "Given that technology and work may be mutually reinforcing addiction patterns" (Porter &Kakabadse, 2006), future research should consider the consequences of the changing nature of work as well as changing technology for instance increased usage of wats app for businesses, which further leads to even more involvement of workholics.

It's not just a problem for the individual, either. Workaholics can also have a negative impact on their colleagues. Workaholics have a tendency to be in control of everything, explains Porter. If they are controlling the useful information and coverup it from others who need it, they can impact the productivity.

Workaholic managers may expect long hours from subordinates and force them to meet impossible standards, putting enormous stress on colleagues.Whatever the workaholic's role, their

productivity reduces. The manual labourer obviously gets tired after long hours, while the white-collar worker loses concentration ability, according to a study.

Interestingly, while work hours and workaholism often go hand in hand, it has been seen that not all people who work long hours can be called as workaholics, and not all workaholics will work for long hours.

Some of the key differences between hard workers and workaholics are explained below:

1. A very important goal of a workaholic is to be busy at all times, they associate the business with importance and believe that the busier they are, the more important they must be.

2. Hard workers think of work as a required and pleasantresponsibility. However, Workaholics see work as a way to distance themselves from unwanted feelings and relationships.

3. Hard workers don't let work overrule so they can be available to their family and friends and try to maintain a balance. Workaholics believe that work is more important than anything else in their lives, including family and friends. And in case work lies as a priority for them in most of the scenarios

4. Workaholics get excitement from meeting impossible demands. Hard workers don't.

5. Hard workers take breaks from the work while workaholics don't as they are more involved in their work. They always think about work regardless of what they're doing or where they are "The workaholic is driven to make sure there's work all the time," explains Gayle Porter, an associate professor of management at the Rutgers School of Business, New Jersey.

Most workaholics are either perfectionists, have a need for control, or have a combination of both traits, she addsWhat can impact a workaholic's life at work, however, is the effect on mental health. "Workaholics feel the burden is all on them. Pressures become mental health as well as physical

health issues," says Porter.Like any extreme behaviour, workaholism has some Signiant physical and mental downsides, combining job satisfaction and creativity with high levels of frustration, stress and exhaustion (Brian Amble 2013)

Robinson adds that workaholics are at a higher risk for depression and anxiety. Workaholism can wreck havoc on relationships, with greater marital estrangement and a higher divorce rate. "Children of workaholics have higher levels of depression, greater anxiety and less confidence," he explains."Workaholism becomes a family disease. In the family everything centres on the workaholic."

Conclusion:

From the study we can conclude that employees work in an organization and still get none of the rewards in return. Many of these people work at companies that lack systems of rewarding exceptional work generates hard workers. For them working is necessary at the same time family is important.

Interestingly, while work hours and workaholism often go hand in hand, it has been seen that not all people who work long hours can be called as workaholics, and not all workaholics will work for long hours.However work will be there in the mind of a workaholic wherever he /she is irrespective of with whom he / she is

Expectation of long hours from subordinates and forcing them to meet impossible standards, putting enormous stress on colleagues is what a workaholic can do.Whatever the workaholic's role, their productivity reduces. The manual labourer obviously gets tired after long hours, while the white-collar worker loses concentration ability. So even though we think that workaholics are better in productivity, there are chances where they can be the reason of reducing productivity from others, especially subordinates.

We can thus say that, busy is not productive. Gardiner urges managers to analyse how people use their time. "Counsel employees to be effective and

productive, not just busy. All too often people are busy being busy," she says. Without productive usage of the time.

Future research should consider the consequences of the changing nature of work as well as changing technology for instance increased usage of wats app for businesses, which further leads to even more involvement of workaholics. The technology is producing more and more competition which further results into more workaholics.

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Talent Retention of Millennials – An Overview

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ABSTRACT

"To win in the market place you must first win in the workplace"

- Doug Conant, CEO of Campbell's Soup

In today's changing business environment, attracting the best of the millennial workers is critical to the future of the business. Securing top-quality talent is essential and it is a nightmare for every manager to recruit and retain the millennials. In this case, companies need to know what motivating factors the Millennials truly appreciate the way that they want to work. Hence, organizations are striving to work to understand those changes that they can make to attract and retain employees, particularly millennials. This paper highlights on diverse sources of literature from organizational and generational studies to illustrate on the practices and policies followed by the company retention of the talented millennials.

Keywords: Millennials, Talent Management, Retention, Retention Strategies.

I. INTRODUCTION

Today's workplace represents the major blend of workforce than any other time in the past. With this blend, companies face a new challenge. The challenge is to stay forefront of the curve. Organizations once used to enjoy the advantage of clasping the top talented candidate by offering an attractive compensation and designation. But then today, the concerns of the top talents have changed and the organizations are focusing more on development, transparency and work-life balance.

Today is the millennial moment, long expected and feared by companies that built their brands for baby boomers. Pew Research Center, the US research group, defines millennials as the 73m Americans aged between 22 and 37, who will next year overtake boomers in number. They are born between 1980 and 2000 entering employment and help in shaping the world of work. Attracting the best of these millennials is critical to the future of the business.

Deloitte Global Millennial Survey 2019, there is always an interruption for opportunities and growth of the economy as millennials is increasingly becoming pessimistic and doubtful of their career and the people around them. It reveals the millennials as generation disturbers. Many companies are struggling to adapt and are facing a loss in top talent. Hence the organizations are focusing on to millennial's desires, while fostering productivity, efficiency, connectivity and community.

In a press release held on 21st March, 2019, Erwin Van Der Vlist, co-founder and CEP of Speak up stated that Companies should tap into millennial's essential desire for personal achievement and a sense of purpose. Attrition has become expensive for companies. Gallup polls states that about 21% of millennials have changed their jobs in the past year which is nearly 3 times more than other generations. Hence, measuring employee turnover and knowing motivational factors is more important for employers in order to retain millennial professionals.

According to a study conducted in Robert Walters, "75% of millennials want an engaging and fun workplace with 'work perks'." Organizations have to ensure their workforce are engaged and satisfied at work. This is possible through a commitment that to help their workforces grow and develop, providing structured training and opportunities and a modern workplace that embraces new developments in technology are all high priorities for millennial workers to achieve their career goals.

II. REVIEW OF LITERATURE

A. Talent Retention of Millennials

The millennial generation is the largest age group to emerge than the baby boom generation. They act as a demographic bridge in reshaping the nation's future. As a bridge to the future, they will face both opportunities and challenges.

John Hester (2013)1, in his article, "The High Cost of Employee Turnover," says that the cost of attrition in a company is very high as 250% of an employee's annual salary. This can even be worse in later years as millennials will comprise the largest part of work force. In the Gall-Up report (2016)2, Millennials: The Job-Hopping Generation reveals that 21% of millennials have changed their jobs within the past year which actually is 3 times more than the other generation.

Lindsay S. Nolan (2015)3, Apart from providing benefits and perquisites, Organizations should also have to focus on addressing the needs of millennials generation employees. A customized leadership styles can be followed in order to encourage leadership skills. Organizations have to focus individual concerns and the formation of working relationships through reverse mentoring and training programs so that millennial generation can be retained.

Gaye Özçelik (2015)4, in his paper highlights on the challenges posed by millennials in the workforce and highlights on the workforce demographics impacts on the characteristics and work orientations that changes in the rules of engagement. In his articles, the author also specifies on the need for new practices and policies that helps in attracting, developing and retaining the millennial group. HR department has to modify its functions to enhance employee engagement. It also emphasizes millennial's values and preferences represents as a new challenge to HRM of organizations and understanding and accommodating these values and preferences of the group will help to win the "war of talent".

John Jerjie C. Reyes and Marvin I. Norona (2019)5, research aims at identifying the factors affecting job satisfaction and retention of millennials in the telecommunication industry, Philippines. The study determines policies, practices and measures for the telecommunication industry that helps in assessing the gap of job satisfaction and employee turnover through formulating employee retention model. Through the developed millennial retention model, organizations can bring into line their current programs and activities to the recommended programs of the retention model.

Ong Choon Hee and Loh Xin Rhung (2019)6, this study investigates the factors that motivate millennials at their workplace. It tries to establish

relationship between intrinsic and extrinsic motivational factors influencing employee retention among millennials and also different methods to retain them in the organization. It also serves as a guide to understand those motivational factors that leads to employee retention especially for millennials which may help in identifying changes that needs to be done for managers and organizations in the near future.

Candace A. Ruiz & Anne Davis (2017)7, the study explores effective strategies to retain culinary-educated millennial employees in a restaurant. The study confined to nine millennial generation employees and three supervisors of a single restaurant corporation participating in semi structured interviews. The study reveals that multiple methods are followed to retain employees in their restaurant. Creating a positive work conditions is very important strategy and supervisors show empathy and care to their employees in order to sustain them in the organization.

MD Mahamudul Hassan, Manimekalai Jambulingam , Mohammad Nurul Alam & MD Shamirul Islam (2019)8 contribute in formulating integrated HRM strategies to retain the Generation Y employees so that they remain fully productive for enhancing the effective outcomes. Active friendly involvement by the Leadership and management should be inculcated along with fulfillment of Generation Y specific requirements like soft HRM, work life balances and ensuring ethical climates. For understanding mediating and moderating effects comprehensive quantitative analysis can be carried out in relation to integrated HRM factors, Job satisfaction and Generation Y retention. Integrated retention approach should include all precursors of turn over related to Generation Y employees and job satisfaction. We need to focus on Servant leadership, management initiatives as innovation led policies and strategies, soft HRM, work life balance, ethical climate and

other specific demands of Generation Y by future researchers.

John S. Buzza(2017)9, This study will help in finding whether millennials are concerned with job advancement and work-life balance in organizations. It hypothesizes that candidates will prefer high work-life balance opportunities than low work-life balance that offers high job advancement with high job growth opportunities. The result of the study reveals millennials are significantly more attracted to a job when there are high levels of work-life balance, but were not significantly more attracted to the job when it came to job advancement.

Haserot (2013)10, highlights that managers has to pay personal attention to each employees as they become a social group and more importantly know each employee's names personally. These group of employees prefer regular feedbacks about their performances rather than reviews taken every six months or yearly basis. According to research done by the University of North Carolina in 2013, nearly 65% of millennials said personal development was the most influential factor in choosing their current job (Kratz, 2013)11.

Gallicano (2015)12, found that six fundamental factors play a vital role in retaining millennial employees in the organization. The six fundamental factors comprise of personality grooming, continuous learning, commitment, interpersonal relationships, prioritizing interests and preferences and strong work environment. Apart from the above said six factors, Thompson & Gregory (2012)13 emphasizes on the need for a genuine, meaningful, individual and trusting relationship with millennials will also contribute for the retention strategy for the organizations.

III. DISCUSSION & CONCLUSION

The above review of literatures highlights on the importance of minimizing the millennial employee

turnover in the organizations. Organizations are striving to understand the necessary changes that have to be made to attract and retain millennials. No matter whatever the size or the stage the business is currently at, organizations requires to retain the millennials. An effective employee retention program has to be designed by the organizations. The retentions strategy will focus on the factors. The factors may be intrinsic and extrinsic in nature that leads personal satisfaction of the millennials. This in turn enhances high productivity at workplace. Though all employees are different, but each has unique desires and goals. An organization accommodating these desires and goals of the millennials by supporting their leadership initiatives and offering extensive training through an effective career pathing program helps in attracting and retaining the era's best and brightest talents.

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Digital India-The evolution of Digital Wallet World

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ABSTRACT

The Indian economy has traditionally been dominated by cash. However, the increased adoption of smart phones together with a favorable regulatory environment are pushing the economy to a less cash-dependent state and promoting the usage of digital payments.Demonetization of Rs.500 and Rs.1000 currency notes, which accounted for over 80% of the bills in circulation, and the subsequent policy measures taken by the Government of India (GOI) and the Reserve Bank of India (RBI) have provided further impetus to digital payments. Some key actions including expansion of the digital payments infrastructure at merchant establishments, expansion into rural areas, relaxation in the Prepaid Payment instruments (PPIs) norms, incentivization of digital payments at fuel pumps, toll plazas, insurance portals etc.Further launch of Bharat QR codes, among others, have helped the adoption of the technology. According to the Reserve Bank of India's data; the digital payments in the market is dominated by card transactions (debit and credit) both in terms of value and volume and thus the number of debit cards in circulation increased from 533 million to 867 million in April 2017 and thenumber of credit cards also increased from 21 million to 31 million in that same time period. The debit card base as of January 2019 is about 930 million, which has grown from 845 million in January 2018 and 780 million in January 2017. Hence, the mobile wallet industry has been on a rapid growth as India moves to cash less economy state. The value and volume of mobile wallet transactions more than doubled last year alone and as such the industry is leading the charge to making India a cashless economy.Increased adoption of smartphones and mobile data packages has been one of the largest contributions to this growth as penetration of the technology increases and mobile data costscome down; the industry is primed for further growth. This research aims to understanding of the digital wallet world and its dynamics to highlight the competitive nature of the market and shed some light on its predicted future trajectory and the challenges that the industry must overcome in order to continue its growth momentum.

Keywords: Digital Wallet, Cashless Economy, Mobile Wallets

I. INTRODUCTION

In the beginning of 2014, smart phones became the dominant internet access tool around the world replacing other portable devices such as laptops and computers. With every new Smartphone user, the potential for interconnectivity through social networking apps such as WeChat, WhatsApp, Hike, Facebook and Snap chat increased exponentially, and it's changing the fabric of global society. Along with the social change enabled by mobile, commerce is being impacted at the same pace.

A. Benefits Of Going Cashless To The Economy

Going cashless has helped in creating a positive impact on society as the paper-based methodology in financial transactions has been reduced thereby

economy in operations, time and cost. Various benefits of going cashless can be listed out as under:

It will help in curbing the generation of black money. The cashless economy has attacked the parallel economy. People who hoard money under their bed, people who launder money bypassing banking channels, terrorist who need money to finance their terror will find difficulty in cashless economy.

It will help in reducing instances of tax avoidance. All the transactions can be monitored and hence traced back to an individual. Income tax officials can easily trace out the transactions and it will become difficult for individuals to evade taxes. Ultimately, it will help in increasing revenue of the government from taxes and more productive activities can be carried out in the economy.

B. Digital India

Digital India is a campaign launched by the Government of India in order to ensure the Government's services are made available to citizens electronically by improved online infrastructure and by increasing Internet connectivity or by making the country digitally empowered in the field of technology. The initiative includes plans to connect rural areas with high-speed internet networks. Digital India consists of three core components: the development of secure and stable digital infrastructure, delivering government services digitally, and universal digital literacy. Launched on 1 July 2015 by Indian Prime Minister Narendra Modi, it is both enabler and beneficiary of other key Government of India schemes, such as BharatNet, Make in India, Start-up India and Stand-up India, industrial corridors, Bharatmala, Sagarmala, dedicated freight corridors, UDAN-RCS and E-Kranti. As of 31 December 2018, India had a population of 130 crore people (1.3 billion), 123 crore (1.23 billion) Aadhaar digital biometric identity cards, 121 crore (1.21 billion) mobile phones, 44.6 crore (446 million) smart phones, 56 crore (560 million) internet users up from 481 million people (35% of the country's total population) in December 2017, and 51 per cent growth in e-commerce.

C. Position of India- As Cashless Economy

A Cashless Economy is an economy in which all types of transactions are carried out through digital means. It includes e-banking (Mobile banking or banking through computers), debit and credit cards, card-swipe or point of sales (POS) machines and digital wallets. At present, India is far behind to other economies with regard to cashless transactions. The ratio of cash to gross domestic product in India is one of the highest in the world-12.42% in 2014 as compared with 9.47% in China or 4% in Brazil. Another report by Boston Consulting Group (BCG) and Google India mentioned that last year around 75% of transactions in India was cash based while it was 20-25% in developed nations such as US, Japan, France, Germany etc. Another statistics has revealed that India has 76.47 billion currency notes in circulation in 2012-13 as compared with 34.5 billion in the U.S. Moreover, various other studies have shown that people prefer to make payments in cash in malls even when they carry credit cards with them. But, the step taken on Nov 8, 2016 of demonetization has pushed digital and e- transaction to the forefront in India due to depletion in cash. Now, e-banking, e-wallets and other transaction apps are becoming more prevalent. The speed of mobile payment transactions is still slow, especially at the POS, where consumers and merchant look for a quick turnaround. Moreover, in areas of poor connectivity, transactions often fail or time out. This results in a poor consumer experience, which disincentivizes them from making mobile payments.

D. Digital Literacy of Consumers

A large segment of the target population is not comfortable with the use of technology. Service providers will need to invest in simplifying the technology and interface, and in educating customers. Indian consumers are in the process of going online to access basic mobile phone services. Because there is no standard platform around which mobile payments are evolving, there is a lack of understanding among consumers and merchants on how they can use mobile payments services. When transactions fail or are stuck at a certain point, they

are unsure of the alternative available to them and its timeliness. Moreover, in a country such as India, mobile as a platform has to be multilingual and should be capable of eventually enabling voice based transactions.

Trusting non-banks as financial service providers Rural India has largely remained excluded from mainstream banking, to the extent that some of the people believe that banking is not for them. In the process, they hoard cash or resort to informal methods of credit such as money lenders. There is a long history of unscrupulous money lenders in India taking advantage of the rural poor in India. Consumers are inherently slow in changing their habit and trusting new service providers, especially when it relates to their finances. Public and private institutions need to come together to educate consumers on how to use mobile as a banking and payments platform to help build trust in the system.

KYC process The KYC process in India is still cumbersome. Most banks and telecom companies require proofs of identity and address in the physical form to open bank accounts. Opening a full KYC compliant mobile money account can take upward of three to four days. While e-KYC has solved the problem of real-time authorization, it requires investment in biometric devices, which are currently expensive. However, with smartphones getting embedded with biometrics (fingerprint and iris scanners), the cost challenge of large-scale procurement of hardware for biometric authentication for KYC or payments is expected to be resolved. Mini KYC accounts with reduced limits have also helped in overcoming this problem, as evidenced by the rapid scale-up of mobile wallet companies. To create improved access, ideas such as KYC portability, shared KYC among institutions and shared procurement of biometric devices at the BC level should be explored.

Easy availability of cash For Indian consumers to use mobile payment services on a regular basis, it is critical that they are ensured that the stored value can easily be converted into cash if required, even in the remotest parts of the country. For instance, even the most financially literate and digitally initiated people in India prefer to carry cash while traveling. Having the comfort of being able to convert stored value to cash is very critical to the Indian context for widespread adoption of mobile payments. UPI can potentially solve this problem by simplifying P2P transfers so much that a person can transfer money to anybody in exchange of cash.

II. LITERATURE REVIEW

As per Ministry of Finance Report (December 2016) on Digital payment, financial inclusion is one of the foremost challenge facing India. 53 percent of India population had access to formal financial services. In this context, digital payment can act as accelerator to financial inclusion. Increasing availability of mobile phone, availability of data network infrastructure, rollout of 3G and 4G networks and large merchant eco system are the critical enablers of digital payment in India. It is further supported by the coordinated efforts of industry, regulator and government. As per RBI's report 'Vision 2018' four pronged strategy focusing on regulation, robust infrastructure, effective supervisory mechanism and customer centricity has been adopted to push adoption of digital payment in India.

KORZENIOWSKI, PAUL (2014) the article discusses the emergence of mobile wallets and how it changed customer experience in payment process. Topics include the appeal of mobile commerce functions in smartphones to consumers, the use of more personalized shopping experiences, and the near field communication (NFC) system. Also mentioned is information on the role of PayPal, the formation of payment infrastructure company Merchant Customer Exchange (MCX), and the selection of an open or close loop design in transactions. INSETS: A Digital Wallet versus a Mobile Wallet; Back to Square One.

AWARENESS AND ADOPTION OF E-BANKING DELIVERY CHANNELS

Adoption is the acceptance and continued use of a product, service, or idea. According to Rogers and Shoemaker (1971), consumers go through a process of knowledge, persuasion, decision and confirmation before they are ready to adopt a product or service. The adoption or rejection of an innovation begins

when the consumer becomes aware of the product. According to Fishbein and Ajzen (1975), attitude is defined as an individual's positive and negative feelings (evaluative affect) about performing the target behaviour. Attitude toward behaviour refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behaviour in question.

Gender has not been found to have a direct effect on adoption of technology in general (Gefen and Straub (1997)), but men and women appear to have different acceptance rates of specific computer technologies, with men more likely to adopt. Cooper (1997) found ease of adoption as one of the important characteristics from the customer's perspective for adoption of innovative service. It stated that innovative products often have superior price/performance characteristics.

III. STATEMENT OF THE PROBLEM

There is a large segment of people whowant to use digital wallets but either is feared of using it (whether something might go wrong while making the payment) or there is another category of the customers who do not know how to use it.There is a huge lack of awareness.

So, there is an enormous untapped market for the digital wallet providers and thus not much study has been carried out with respect to this in India.

IV. OBJECTIVES

To trace out the digital wallet payments in comparison with IMPS, UPI between 2016-18 to estimate the effect of demonetization on the share of monthly digital payment volumes. To forecast the volume and value of mobile wallet industry (FY17-FY21)

V. RESEARCH MEDTHODLGY

Type of study: It is a quantitative and qualitative study

Data source: Secondary source of data

VI. FINDINGS

Digital wallet payments from FY13-FY17
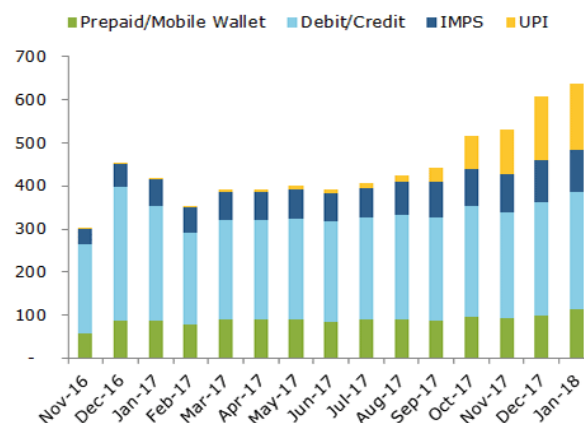
Source: Reserve Bank of India

Effect of demonetization on the share of monthly digital payment volumes
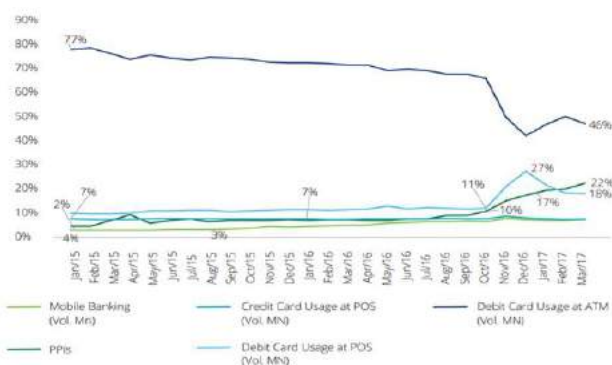
Source: NPCI

Volume and value of mobile wallet industry (FY17-FY21)

GROWTH IN NUMBERS

Source: NPCI
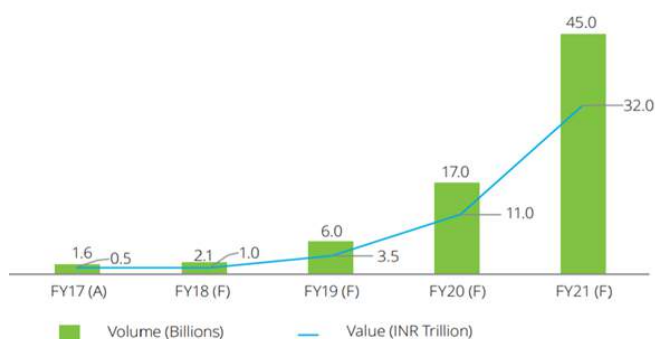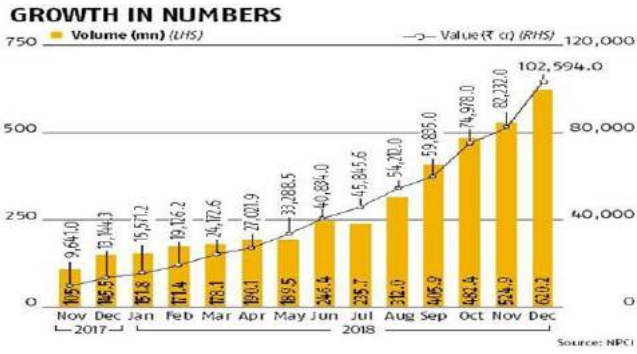
VII. CONCLUSION

Mobile should be the preferred payments form factor for urban transit. Securing transactions will lead to seamless payments. Government Initiated Payments application should be encouraged. Digital payment application like Fastag should be implemented in all Toll plazas and encourage the users to go cashless and use digital methods for payment of toll fee.

Digital Thought : A Strategic Imperative for Banks Operating in a VUCA World

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ABSTRACT

Banks competing in the VUCA world base their strategic planning on competition, regulations and macro-economic indicators, in general. Strategic mandates arising out these segments are often implemented using technology initiatives. Beyond the conventional IT efforts, the realm of digital thought requires strategic attention. This is necessitated by the pervasiveness of digital ways of doing business and the flexibility and agility that they offer. It is no longer a matter of choice but more of an imperative for survival. The work explores the focal points covered by strategic planning process and brings out the dependence on digital paradigm for implementation. Incorporation of Digital Thought in the strategic planning process is proposed as a solution to cover the gap.

Keywords: Digital Thought, Bank Operation

I. INTRODUCTION

The advent of the Digital Age has led to a paradigm shift in the manner in which financial services industry engages with the Customers. The Customer in the digital age has expectations which are considerably different. For instance, India has a sizeable population under the younger demographic profile (53.7 % of India's population is under the age of 24 as per the latest Census data), the rate of adoption of Digital Customer Engagement and Service models is expected to be way ahead of the rest of the world.

Financial Services Industry has led the wave of this innovation by means of presenting newer channels of engagement to the prospective customer. In order to optimize Business Processes for Customer service, there has been a strong emphasis on Digital innovations targeted at improving Operations and Service thereby creating sustainable competitive advantage.

The intent of the work is to explore the manner in which digital initiatives have become an imperative and integral aspect of strategic planning for Banking Industry in view of the volatility , uncertainty , complexity and ambiguity in the current business landscape.

The paper will start with drawing a context which emphasizes the introduction of digital initiatives and their importance for Banks to stay relevant in the face of competition and then move on to analyze the strategic challenges posed by a VUCA environment. Finally, a practice driven approach to tackle the challenges by incorporating digital strategy in to the conventional strategic planning effort, will be suggested.

The objective is to present the approaches which Banks can take on the Digital Strategy front to help them stay relevant and further create blue oceans.

II. PROBLEM STATEMENT

There is considerable thought in the direction of navigating banking businesses well in the dynamic competitive, macro-economic and regulatory context. The key focal of strategic planning has been driven by such needs. But more often than not, the implementation of such strategic mandates requires evaluation of technology driven solutions.

Beyond being a source of solutions, digital technologies also pose another significant challenge. There is evidence of use of digital thought and technology to create disruption to the conventional Business models on which Banks operate. This has brought about a strategic inflection point on the Banking industry.

Moving forward , the large scale Banks operating on conventional business models will have to add a digital paradigm to the strategic planning process. From Customer engagement to service, from product propositions to risk management and regulatory compliance , Banks are faced with dynamics of change and the requirement to respond with agility has become much more pronounced.

The nature of stakeholder's expectations from a Bank have changed drastically over the last couple of decades. Customers expect an omni-channel presence with conventional push driven sales being replaced by Customer journeys to fulfil needs with holistic solutions. The customer service aspect has become a key tenet of the value proposition. Expectations on the turnaround time have increased and tolerance towards miss-selling has reduced, thereby, making customer service more challenging. On the regulatory quadrant, the compliance norms from regulators have become more stringent and adds to the cost of doing business.

The paper intends to explore the digital initiatives as the fourth quadrant to be considered for strategic planning apart from the three existing quadrants of Competitive landscape, Macro-economic environment and Regulations and Compliance.

It must be mentioned that most organizations do consider technology from a implementation and solution perspective but the idea of digital goes beyond technology to encompass creation of new business models, better ways of customer engagement and improved approaches for risk management.

III. REVIEW OF LITERATURE

The review of existing literature focused on , firstly, understanding what VUCA implies for strategic planning and secondly, what are the challenges Banks face on the competitive , macro economic and regulatory fronts?

A. Understanding implications of VUCA

Nathan Bennet and G. James Lemoine explain the meaning of VUCA in their work published in the Harvard Business Review in the first quarter of 2014. They place Volatility, Uncertainty, Complexity and Ambiguity in four slots within a quadrant with axes being defined based on Knowledge about the situation and ability to predict the outcomes of actions. They explain the characteristics and approach in each situation. They argue against the idea which professes the futility of strategic planning in face of VUCA. On the contrary they present 'Innovation' and 'Flexibility' to be built in to the strategy, from planning to execution.

VUCA is evaluated with knowledge about the situation and predictability of outcomes as parameters. For volatility, it is advised to devote resources to preparedness. In case of uncertainty, information and data collected to arrive at a conclusion is advised. Bringing in specialised resources to tackle complexity works in most situations and for ambiguity, experiments to understand the situation better is suggested.

It is suggested that strategic planning needs more calibrated thought and each of the V, U, C and A need different approaches to deal with, else it leads to poor decision if one approach is adopted for all of them.

B. Challenges Faced by Banks

Literature was reviewed to understand the challenges faced by Banks in competitive , macro- economic and regulatory context. Xavier Vives talks about the impact of competition in the Banking Sector, the impact on stability and the role of regulatory environment in such context. In his book, 'Competition and Stability in Banking' he talks about the trade offs to assure stability which can be achieved by prudent regulation.

Iryna Aloshyna in her paper 'Competitive Issues in Banking : Theoretical Approaches Overview' argues that the challenge in Banking Sector from a competitive context arises due to intangible nature of services and lack of free entry and exit from the sector. Competition has become more intense due to availability of tradition banking services from non-banking players. Development of Financial Markets, better access of foreign banks to domestic markets and flow of capital between markets add to the complexity in terms to value proposition and performance measurement.

The impact of macro-economic environment is another aspect that gets factored in the strategic planning exercise. Most of the literature reviewed studies the relationships between GDP and bank profitability and inflation and bank profitability. In the paper 'Internal and External Factors Affecting Bank Profitability : Evidence from Albanian Baking Sector' , Blerta Bami argues that Real GDP growth was found to have positive impact on Bank profitability. The same is true for anticipated inflation as Banks strategize to adjust rates. The view on these aspects is very varied. Some authors profess that the macro-economic factors have very minimal impact on the bank profitability. Nevertheless, it is understood that macro-economic environment and the related indicators definitely are inputs to strategic planning.

The next key tenet is the regulations and compliance aspect and its incorporation in the strategic planning. The existing literature in this regard is very focused. Alessandra Tanda in her paper titled 'Effects of Bank regulation on Capital and Risk' studies the impact of capital and liquidity requirements set forth by regulators worldwide on Bank's strategy. David Cruikshank in his paper 'Impact of New Banking Regulations on Corporate Relationships' talk about the how banks will start evaluating the impact of a large corporate relationship on the key ratios.

Andy Efstathiou in the paper 'How New Banking Regulations will impact Banks, Customers and Vendors in 2015/16' specially points out the need of increased disclosure towards customers and how this could be challenge for Banks operating on legacy infrastructure.

It is important to mention that technology driven solutions to strategic mandates have been found to be received positively by bank employees and customers as evidenced from the study titled ' Employee's attitude towards adoption of IT based Banking Services' conducted by Krishna Murari and Bindiya Tater.

To conclude, review of existing literature reemphasizes the importance of competition, macro-economic parameters and regulatory environment on the strategic context in which Banks operate. It is worthy to note the role that technology plays an enabler and the all pervading presence of such interventions is very evident.

IV. ANALYSIS AND PROPOSED APPROACH

The analysis of the given problem again will focus around the aspects which get attention during the strategic planning process. The analytical view for each of the segments is as follows :

1. Competition: The idea of competition from a strategic point of view is very broad and encompasses the facets of market strategy, product strategy , pricing strategy and Customer engagement strategy. On the market strategy front, Banks are faced with decisions regarding which markets and segments to compete in since such choices come with tactical implications. On the product front expansion of product lines coupled with pricing decisions require careful thought. It is important to note that all such decisions have to be supported by operational capability to execute.

More importantly, on the customer engagement front, the expectations from customers have changed drastically and is in a state of constant flux. The strategic choices in this aspect should also reflect agility.

The advent of the digital paradigm makes the competitive scenario more complex. Consider the fact that traditional Banks now are facing competition from Click Only/Click and Mortar players who present formidable competition in the niches where they compete. Some of them have been able to create blue oceans for themselves. On the aspects of product and pricing as well, the time to market expectations have shortened. Banks are gradually moving towards value based pricing of products. The branding efforts also have now moved beyond the conventional mediums towards incorporating digital media. Within the Banking sector, many players are using big data to devise customized value proposition.

It is therefore safe to assume that the competitive scenario mirrors all aspects of a VUCA world where the competitive strategy must be enabled by digital thought.

2. Regulatory Environment: Post the financial crisis in later part of the last decade, the Regulators globally have taken proactive steps towards strengthening the frameworks which are mandated for Banks. Focus BASEL norms present a comprehensive picture. The Regulatory focus has dwelt, apart from other things, on customer protection and reducing the information asymmetry in the transactions between a Bank and its Customer. The Mortgage Credit Directive is a clear example.

Data is the next most important asset after customer relations. Recent times have seen the regulatory norms moving towards strictness on this aspect. The implementation of GDPR (General Data Protection Regulation) illustrates the same.

There is vast body to global, regional and local regulations which have been brought in force newly or updated to reflect the regulatory concerns. A detailed study of all of them is beyond the scope of the current context. In general, the implementation of such regulations means increased cost of doing business for Banks. Also, the monitoring of Bank's activities has been intensified. The cost of non-compliance has increased. It can be concluded that the implementation of Regulations symbolize and add to the 'C' –complexity of the environment in which Banks operate.

More often than not, implementing such solutions for compliance goes beyond operational interventions and involve the use of digital technologies. Reg Tech is a commonly used term for digital interventions dedicated to help Banks stay compliant.

3. Macro-economic Environment: This is one area which Banks monitor in order to derive clues for competitive strategy formulation. It is more of a source of input and a subject of interest for Bankers. However, the importance cannot be understated.

For instance, the lending strategy for various industry sectors can be sharpened based on picture presented in the reports published by the policy makers.

The situation of interest encompasses key figures like GDP growth, Per capita Income, Growth in different sectors of economy, Deficit figures, Key areas of Government spending etc. Banks derive their segmentation, market entry and long term strategic inputs from aforementioned parameters which define the macro economic environment.

Depending on the country, the situation could range from Complex in a best case scenario to Volatile in a worst case scenario. The parameters that Banks look at are derived based on data collection and analysis

organized by Governments , Regulators and in-house research teams. On this front again, Digital interventions such as Big Data assure agility and integrity in the effort.

The situation analysed evidently points to the understated perspective in the Strategic Planning process. The implementation of strategic mandates arising from competitive strategy, regulatory environment and macroeconomic context involve the use of technology beyond customization of legacy platforms and existing systems. They are required to be much more flexible, based on design thinking and agile so as to help Banks navigate in a VUCA world.

This is the space where digital thought needs to be incorporated in the strategic planning process. Examples of considerations from the Digital perspective are as follows:

- Choice of platform and cost of regulatory compliance
- New Business models based on digital platforms
- Automation of first level of customer engagement and service
- Channel mix to compete in a market
- Improvement of ServQual levels
- Improved risk management
- Time to market in product launches
- Customer centricity and empowerment

Aforementioned are only indicative examples. A complete list can be drawn based on context. Implementation of strategy presents a strong case for incorporation of digital paradigm beyond technology in to the strategic planning process. It presents an opportunity to create a sustainable model that is flexible , competitive and compliant.

Figure 1: Incorporation of Digital thought in the Strategic Planning Process

V. CONCLUSION

It is imperative for Banks to include Digital Thought in the strategic planning process so that they are equipped to survive and thrive in a VUCA world. It is important to appreciate that the volatility, uncertainty , complexity and ambiguity have been exacerbated by the advent of digital strategy and its implementation. Therefore, strategic thought and approach in this direction is strongly recommended. This goes beyond the attention that IT strategy and planning get as of now. It is important to understand that Information Technology is a hygiene factor whereas Digital initiatives could lead to distinct positioning and sustainable competitive advantage.

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Glitches Outlook of Green Supply Chain Management (GSCM) and Environmental Sustainability in Indian Manufacturing Firms

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ABSTRACT

Greening commercial practices and initiatives have received increasing research attention. This study explores the drivers of and barriers to the implementation of GSCM in the Indian manufacturing firms. A qualitative study was conducted in the form of structured questionnaires with business level managers in different organisations in the manufacturing firms. The study identified four drivers and barriers within the Indian framework. The most significant drivers are corporate social obligation, interior hierarchical strategies, and board and top administration support. Expenses and Government assemblies was recognized as the hindrances with the best effect.

Keywords: GSCM, Manufacturing Firms, CSR, Environmental sustainability, India

I. INTRODUCTION

Green Supply Chain Management is a tied in with conveying items and administrations from providers, producers to end clients through material stream, data stream and income about condition. Conventional Supply Chain Management centres on Total Quality, ideal Cost and best assistance that here and there added to condition. The present Green Supply tie the executives commands to join the natural thought in every single phase of the item and administration in a Supply Chain. Thus Supply chain chiefs have an incredible job in creating imaginative ecological advances to handle the issues looked by the economy on natural issues and convey this to each collaborate in the chain. Lean Manufacturing is disposing of waste in each phase of store network. It centres on delivering financially and naturally well-disposed quality items, which meets the client desire. It is the best practice to be pursued since it lessens stock, spares space and vitality. Henceforth Lean

assembling adds to the Green condition. EPI is to quantify the adequacy of ecological exhibitions of a nation. This measure gives the subtleties on how close the nations can build up ecological well-disposed approaches and strategies.

Product Selection: Planning the item so that it ought to be use, making least contamination and devours less vitality. It ought not be perilous during stockpiling, transportation and furthermore while arranging once it arrives at end of its item life cycle. DFE is a tied in with creating items that has no negative reaction for human and condition, practical understanding and condition agreeable. This training must be executed in item configuration organize. Procedure and generation: plan Process with the goal that it fits in with the Green Supply Chain Management activities to diminish natural negative effect. This adds to lean assembling. All potential outcomes must be check for reusing the Scrap materials. Colleague's choice: Selecting providers

who have demonstrated records of accomplishment on rehearsing lean assembling and utilizing condition-inviting material. Eventually it brings about client joy and fulfillment. Coordination Design: Efforts ought to be a polished to lessen fuel utilization. They can accomplish by setting up providers close to the OEMs (Original Equipment Manufacturers) and its Hubs. Coordination accomplices must be an incorporated while item structures with the goal that it improves cubic space usage and compelling armada the board. Back pulling ought to be a rehearsed where the vacant vehicle ought to be a utilized to gather the products from different sources once subsequent to conveying completed merchandise. Bundling Material: Replacing bundle materials, which are eco-accommodating. Fumigation testament ought to acquire for global shipments for wooden beds and boxes. Bundling material must structure in such a manner it very well may be re-utilized and re-cycled. Bundling ought to be powerful so any perilous material inside it does not overflow and cause ecological danger. Turn around coordination Design: Materials subsequent to devouring ought to be a viably utilized for re-use, fix, reuse, remanufacture and redistribution. It calls for reusing holders and beds, upgrading and reusing bundle materials and so on. Decreasing contamination during transportation are significant exercises of turn around coordination. Legitimate structure of Reverse coordination contributes more prominent towards Green Supply Chain Management. Data Technology: A Green way to deal with IT must be an accomplished through different programmed forms along these lines decreasing carbon impressions. Paper use must be limited through programmed receipt/instalment handling. Green Building: Deploying greener rehearses in Design, development and keeping up the structures. Utilizing vitality effective bulbs, characteristic lightning spares impressive vitality. Water must be a reused for everyday use.

II. MATERIALS AND METHODS

Sarkis, J. (2012) the systems and survey additionally give chance to supervisors and associations to all the more extensively comprehend issues hidden green inventory network the board. Greening supply chains has become a need as natural concerns have stayed at the bleeding edge of the discussion of worldwide and nearby social interests. Miemczyk, J et al, (2012) this paper reveals two unmistakable patterns in the sort of research did. To begin with, interior or dyadic issues are in centre and second, a propensity to manage natural, rather than social, maintainability. In spite of the need to look past the dyad given the dangers related with the all-inclusive system, barely any examinations do as such in any of the maintainability measurements. The paper distinguishes zones open to future research and gives functional bits of knowledge into how supportable acquiring and supply is an estimated. It additionally incorporates existing proportions of supportability at various levels and sorts out these into scientific categorization.

Green, K., Zelbst et al, (2012) largely, the selection of GSCM rehearses by assembling association's prompts improved ecological execution and monetary execution, which, thusly, decidedly sway operational execution. Operational execution upgrades hierarchical execution. Specialists are given a structure for surveying the synergistic effect of GSCM rehearses on execution. Inward ecological administration and green data frameworks are recognized as important forerunners to the usage of green acquiring, participation with clients, eco-design, and venture recuperation. Abbasi, M. furthermore, Nilsson, F. (2012) from the orderly survey five significant territories of difficulties for inventory network the executives are inferred: costs, intricacy, operationalization, mentality and social changes, and vulnerabilities. From these zones, blending dialogs are given and research recommendations proposed. It is inferred that there is an incredible requirement for models and systems that consider the unpredictability in question, take comprehensive points of view, and challenge the essential suppositions fundamental the vast majority of the examination distributed (for example reductionism, positivism and financial development). The outcomes displayed in this paper give an efficient structure to arranging issues identified with coordination supportability; something, which will be advantageous for directors, and policy-makers when they approach economical production network the board difficulties.

Wu, G. (2013) Supplier, client and inside joining improve both green item and procedure

advancements. Request vulnerability emphatically directs each GSCI-green development connect. In any case, the directing impact of innovative vulnerability is irrelevant. This investigation contends that, to improve green advancement execution, supervisors should try to coordinate assets and capacities inside their associations, providers and clients. It likewise proposes that directors ought to continually pursue request inclines in the market and keep up tight mechanical systems among store network accomplices. Hsu, C., Choon Tan et al, (2013) The examination uncovers four vital drivers of green production network selection that all in all influence an association's green acquiring, design-for-environment and invert coordination activities. This examination reveals a few urgent connections between green production network drivers and activities among Malaysian makers.

Wilburn Green et al, (2015) fabricating professionals are furnished with data underlining the significance of actualizing and keeping up a solid market direction as an antecedent to building up an ecological manageability methodology. The outcomes have significant cultural ramifications, in that an advertising approach that prompts the more quick reception of natural maintainability programs inside the assembling part is distinguished. Cosimato, S. what's more, Troisi, O. (2015) advancement impact on inventory network the board (SCM) greenness, a procedure situated to a reasonable and natural well-disposed way to deal with the executives of store network. As indicated by DHL contextual investigation proof, in coordination advancement, regularly dependent on rising green innovations, is a carefully identified with the improvement of a significantly more practical and condition neighbourly way to deal with SCM, in view of decrease of canter exercises' environmental effect, cost sparing, quality, unwavering quality, execution and vitality proficiency. In this specific situation, the regard of natural guidelines is principal to accomplish a decrease of biological harm, yet additionally to generally monetary benefit.

Singh, A. furthermore, Trivedi, A. (2016) there has been an expanded enthusiasm among analysts and specialists in the region of practical green inventory network the executives in the previous decade. A requirement for accomplishing supportability through selection of greener rehearses, attributable to an expanding natural and biological unpredictability. The audit uncovers that there exists a need to address conduct issues like human asset the board and store network accomplice relationship the executives. Besides, turn around coordination; shut circle store network the executives and waste administration are territories that need uncommon concentration to accomplish natural manageability. B. (2016) the investigation proposes that the principle drivers of GSCM incorporate the ecological strategy and the green human asset the executives by giving them preparing to embracing maintainability rehearses. Other than this, another key driver is the manageability criteria in provider determination, which was upgrading the results of maintainability. The examination directs the chiefs for executing reasonable store network the executives rehearses in the association. The model including nature arrangement (appropriation), green human asset the executives (dissemination), green innovation (dispersion), and GSCM. Dubey, R et al, (2017) green or maintainable production network the board (GSCM/SSCM) has as of late pulled in a lot of consideration from the scholarly world and professionals in all piece of the world. As of late, all humankind has encountered extreme environmental change, which is a generally credited to human movement. Destructive outflows have made a significant commitment to late environmental change, which presents significant difficulties, and dangers to the completely human race in type of an unnatural weather change, seismic tremors, sea tempests, tidal wave and floods. The purpose of this paper is to propose a conceptual GSCM/SSCM framework contributing to knowledge-based view theory and systems theory (ST) and provide an exhaustive list of further research directions. In this paper the authors have proposed a conceptual framework for sustainable supply chain network and at the end the authors have outlined further research directions.

Based on the reviews we have been formulated following questions

What are the drivers that motivate the implementation of GSCM in the India manufacturing firms?

What are the barriers that prevent the implementation of GSCM in India manufacturing firms?

Which drivers and barriers have the greatest/least impact on the implementation of GSCM practices in the India manufacturing firms?

III. RESULTS ANALYSIS

Design	: Descriptive research design
Data Collection	: Primary and Secondary
Scaling	: Likert scaling techniques
Sampling	: Convenience sampling is a non-probability sampling technique
Size of sample	: 115 business level managers of manufacturing firms in Bengaluru
Statistical tool used	: Frequency analysis, Mean, SD and regression analysis

Table 1: Frequency analysis of demographic

Demographic		No	Percentage
Gender	Male	84	73
	Female	31	27
Edification	Engineering	68	59
	Science	15	13
	Management	32	28
Experience Yrs	<=10	55	48
	11-15	33	29
	>15	27	33
		115	100

Table 2: Mean, SD and Cornbach alpha reliability rest

Independent variables	Mean	SD	Alpha
Government rules and regulations	4.10	0.62	0.85
Green image and competitive improvement	4.10	0.77	0.78
Public force and consumer consciousness	4.07	0.67	0.65
Social and ecological accountability	3.97	0.59	0.66
Economic enhancement	3.97	0.65	0.85
Corporate social responsibility	3.96	0.60	0.82
Structural policies of firm	3.93	0.59	0.77
Board and top administration obligation	3.91	0.57	0.63
Manufacturing specific - Size of market	3.89	0.56	0.69
Lack of top management support	3.88	0.57	0.85
Lack of information and involvement	3.87	0.56	0.74
Cost of application of GSCM	3.84	0.63	0.82
Lack of top administration sustenance	3.80	0.63	0.75
Technology factors consciousness	3.73	0.82	0.81

Table 3: Regression Analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.669[a]	.448	.394	1.60838	.448	8.292	14	114	.000

a. Predictors: (Constant), Technology factors consciousness, Board and top administration obligation, Social and ecological accountability, Lack of top administration sustenance, Cost of application of GSCM, Structural policies of firm, Green image and competitive improvement, Manufacturing specific - Size of market, Public force and consumer consciousness, Government rules and regulations, Lack of information and involvement, Economic enhancement, Lack of top management support, Corporate social responstbility
b. Dependent Variable: Environmental Sustainability

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	300.309	14	21.451	8.292	.000[b]
	Residual	369.925	143	2.587		
	Total	670.234	157			

a. Dependent Variable: Environmental Sustainability
b. Predictors: (Constant), Technology factors consciousness, Board and top administration obligation, Social and ecological accountability, Lack of top administration sustenance, Cost of application of GSCM, Structural policies of firm, Green image and competitive improvement, Manufacturing specific - Size of market, Public force and consumer consciousness, Government rules and regulations, Lack of information and

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.455	.772		.589	.557
Government rules and regulations	.283	.117	.253	2.426	.017
Green image and competitive improvement	.037	.099	.035	.370	.712
Public force and consumer consciousness	.037	.110	.034	.333	.740
Social and ecological accountability	.272	.123	.230	2.218	.028
Economic enhancement	-.051	.103	-.053	-.490	.625
Corporate social responsibility	-.068	.123	-.063	-.554	.581
Structural policies of firm	.012	.106	.011	.117	.907
Board and top administration obligation	.145	.109	.133	1.329	.186
Manufacturing specific - Size of market	.177	.117	.145	1.510	.133
Lack of top management support	-.187	.140	-.149	-1.343	.181
Lack of information and involvement	.090	.102	.095	.882	.379
Cost of solicitation of GSCM	-.197	.105	-.167	-1.877	.062
Lack of top administration sustenance	.165	.106	.151	1.558	.121
Technology factors consciousness	.174	.098	.161	1.771	.079

a. Dependent Variable: Environmental Sustainability

IV. Conclusion and Managerial Implication

Affiliations appear to have a mix of drivers and boundaries concerning GSCM rehearses. A writing audit was to make an establishment and comprehension of the investigation. It is perceptible that past investigations concentrated more on the recognizable proof of drivers than boundaries. This could be because the investigations was led in progressively created nations and concentrated on the positive parts of GSCM. In this exploratory investigation, the drivers and hindrances were obviously recognized. Four drivers of and eight hindrances to the execution of GSCM were recognized in the Indian assembling firms. The drivers recognized in the investigation are corporate social obligation, hierarchical strategies, board and top administration responsibility and nearby network. Supplementary drivers was recognized in the writing audit. In light of the appropriate responses given by the respondents with respect to what they viewed as the most significant drivers, the ones that apply the best power are principally

interior to the association and incorporate corporate social obligation, inner authoritative strategies and board and top administration support. The boundaries distinguished are outer in nature and incorporate culture, cost, defilement, government enactment and absence of motivating forces, client numbness, and absence of instruction/information, firms' particular hindrances (the organizations' size) and innovation. More obstructions were recognized in the examination contrasted with the writing audit.

As per the members, the hindrances that apply the best power are culture, cost and government enactment. This examination makes an interesting commitment by coordinating existing writing and distinguishing drivers of and obstructions to the mix of GSCM rehearses in the Indian assembling setting. The discoveries negate the writing audit, in which the administration is a considered as perhaps the best driver in the execution of GSCM rehearses.

In India, it is the absence of government enactments and bolster that go about as probably the best boundary repressing GSCM execution. The examination shows that the significance of corporate social duty is available in the Indian assembling firms. This is in accordance with the writing survey, which set up that corporate social duty is a driver in the execution of GSCM rehearses.

Advantages of GSCM: GSCM will assist us with gaining an upper hand and help us to pull in new clients. Expanded utilization of assets, improved productivity and diminished creation cost. It contributes more noteworthy towards improved money related execution. Diminishes chance by maintaining a strategic distance from dangerous material that prompts natural impact. Improved nature of items and administrations gives higher client pleasure and notoriety.

The outcomes offer directors the chance to comprehend the components that drive and keep their associations from actualizing GSCM rehearses. In India the absence of Government, enactment and bolster go about as perhaps the best obstruction restraining GSCM usage. Supervisors ought to apply pressure on the neighbourhood governments to set up rules, enactments and emotionally supportive networks to energize GSCM. The outcomes

additionally show that debasement is a functioning obstruction in the Indian assembling firms. It was not a distinguished as an obstruction in the writing survey. This is presumably because of it being an extremely delicate theme which members are reluctant to talk about. Directors supporting their associations to practice environmental safety in India must know about this factor and be set up to counter this by revealing degenerate people. They ought to effectively battle against the finalizing of deceptive negotiations and the utilization of rewards to sidestep existing principles and guidelines. The examination likewise found that top administration support is a pivotal driver. This shows chiefs the significance of their job in rousing and preparing representatives. Top the board should make workers mindful of the advantages of actualizing GSCM. The achievement of executing GSCM depends eventually on them.

V. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

At first, the sample size is little and is constrained to colossal makers in the organizations of Bengaluru city as it were. The examination results cannot be utilized to make a decisive rundown of drivers and hindrances in the usage of green store network in Indian assembling associations. Future investigate must be led joining little and medium estimated makers, with a bigger example size. This should be possible by directing a review. Besides, the outcomes depended on interviews with single people in every association. This does not take into account the investigation of various perspectives from inside the association. Future research of a similar sort should be directed in a comparable setting to the Indian monetary condition, which is a creating nation. This would take into consideration an examination of the connection between the drivers and hindrances in executing store network the executives rehearses. Further research could be directed to examine the purpose behind this. Research on the distinctions of government jobs in GSCM rehearses in creating and created nations. Constrained look into has been led on GSCM in creating nations as most studies are centred on created nations.

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Journey of Union Budget in India

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ABSTRACT

Every year, country governments world over envisage on preparing and presenting to their people a proposal called budget. Through this mechanism the government shares its plan of future course of action, particularly in terms of its revenues and expenditure for a period of one year called the fiscal year. In India also, this exercise is in practice since a long time. Our finance minister has the privilege of presenting the union budget to the parliament every year in the month of February. Our first budget was presented by James Wilson way back on 18th February 1869. The first finance minister of the independent India Sir R.K. Shanmugham Chetty, who was not a member of the congress presented the first Indian budget on 26th Nov 1947. Morarji Desai has the distinction of presented 10 budgets for the country which is the maximum number so far presented by an individual in India. Carrot and stick budget was presented by VP Singh in the year 1986. The Epochal budget was presented by Dr. Man Mohan Singh which transformed the EXIM policy. In the year 1997 P. Chidambaram presented a dream budget which resulted in the moderation of tax base. This resulted in an overall improvement in income tax collections. Balanced economic growth with a focus on equality and social justice has been the cornerstone of union budget in India. Among others, the Economic growth, Reducing poverty, Creating employment opportunities, Reducing inequalities in society thereby giving way for redistribution of Income, allocation of resources, curtailing inflation, ensuring economic stability and management of public enterprises are the broad guiding principles within which the union budget is prepared. Analysis of budgets revenues and expenditure over a period of time reveals that major heads of governmental revenues comes from Corporate tax, Income tax, Customs, Union excise duties, Service tax & other taxes, Non-tax revenues, Non-debt capital receipts, Borrowings & other liabilities. Similarly, major heads of governmental expenditure is on States share of taxes and duties, Finance commission and other transfers, Subsidies, Defence, Interest payments, Central sector schemes, centrally sponsored schemes and other expenditure & Pensions. A secondary analysis of revenues and expenditure in Indian budgets does not show much change as a proportion in the governmental revenues and expenditure between 2017 and 2019.

Key words: Budget, Revenues, Expenditure, Finance Minister, Taxes, Duties.

I. INTRODUCTION

Every year, the finance minister presents the Union Budget to the Parliament. Budget is an estimate of income and expenditure of our country generally for a year. It is presented in the month of February and after deliberations and revisions will become effective from the next financial year starting from 1st of April. Our union budget has under gone a remarkable history over the years.

History of Union Budget in India: Our first budget was presented by James Wilson on 18th February 1869. The first finance minister of the independent India Sir R.K. Shanmugham Chetty, the erstwhile Diwan of Cochin state was not a member of the congress who presented the first Indian budget on 26th Nov 1947, followed by the budget of 1948. After his resignation as the Finance Minister, John Mathai presented the subsequent budgets for the years 1949-50 and 1950-51. The budget 1949-50 is considered as a budget for a really united India as it included all the princely states. It was decided to have the planning commission and five year plans. His successor C.D. Deshmukh had the biggest challenge of finding money for the five year plans as this meant for higher taxes. He tried to woo the taxpayers. The budgets of the 1950's saw foreign aid inflows coming from nations like the US, UK, USSR and its allies like the Czechoslovakia and the Romania. TT Krishnamachari who replaced Deskmuch in the year 1957 levied wealth tax and the expenditure tax. Morarji Desai presented 10 budgets which is the highest number of budgets presented so far. In his 1968 budget he removed the stamping and assessment of goods by the excise department at the factory gate. In order the boost manufacturing a system of self assessment of manufacturers was introduced which also reduced the administrative burden on the excise department. Spouse allowance was withdrawn when both the wife and husband were tax payers.

Carrot and stick budget was presented by VP Singh in the year 1986. It was revolutionary in terms of Indirect tax reforms. Enforcement directorate was given more powers to act against tax evaders and curbing corruption. The epocahal budget was presented by Dr. Man Mohan Singh which transformed the EXIM policy and regulated balance of payment position of India. In the year 1994, the service tax was introduced. In the year 1997 P. Chidambaram presented a dream budget which resulted in the moderation of tax base. There was an overall improvement in income tax collection.

Basic Framework for Budgeting in India: Balanced economic growth with a focus on equality and social justice has been the cornerstone of union budget in India. Among others, the Economic growth, Reducing poverty, Creating employment opportunities, Reducing inequalities in society thereby giving way for redistribution of Income,

Allocation of resources, curtailing inflation, ensuring economic stability and management of public enterprises are the broad frameworks within which the Finance minister thinks about the framing the union budget.

Variants of Union Budgets: Considering the amount of estimated receipts and expenditure of the union government for the ensuing financial year, the union budget may be either classified as balanced budget or surplus budget or deficit budget. A balanced budget is one when the governments estimated receipts are equal to its expenditure. This means that the estimated receipt's and estimated expenditure are neither more nor less, they will be same. In practice, balanced budget is not a reality as estimated receipts and estimated expenditure may not be same. If the amount of governments estimated receipts are more than its expenditure, it can be said that the budget is a surplus budget. This only means either the government is taking more by way of taxes from its citizens or the government is not pumping its revenues into the economic system. Surplus budgets are suggested in times of severe inflation due to excess demand. Countries like Germany, Hong Kong, South Korea, Qatar, Norway, UAE, Oman, Singapore, and Denmark have surplus budgets in recent times. When the amount of governments estimated expenditure is more than its Income, it can be said that the budget is a deficit budget. Countries like India, Argentina, Bhutan, USA, UK have deficit budgets in the recent times.

Economists differ in their view on the surplus budget and the deficit budget. Adam smith advocated the fact that the government expenditure should never be more than the government revenues. He suggested balanced budget for the governments. However, Keynes was against a balanced budget as the governments expenditure will fall short of the amount required to be spent for fuller employment. He was of the opinion that the government should increase expenditure to reduce the gap between the essential expenditure for full employment and the expenditure that can be spent by the governmental revenues. The governments can cover this gap either by way of borrowings or drawing from its reserves.

Heads of Governmental Revenues: Considering the various heads of government revenues, the major heads includes Corporate tax, Income tax, Customs, Union excise duties, Service tax and other taxes, Non-

tax revenues, Non-debt capital receipts, Borrowings & other liabilities.

II. PATTERN OF HEADS OF GOVERNMENTAL REVENUES (2017 TO 2019)

Heads of Governmental Revenues	2017-18	2018-19	2019-20
Corporate tax	19	19	21
Income tax	16	16	16
Customs	09	04	04
Union excise duties	14	08	08
Service tax and other taxes	10	23	19
Non-tax revenues	10	08	09
Non-debt capital receipts	03	03	03
Borrowings & other liabilities	19	19	20
Total	100	100	100

In the year 2019-20, in a rupee that the government receives by way of its revenues, 21 paisa was budged to come from the corporate tax and 20 paisa from the borrowings and other liabilities. Receipts by way of service tax and other taxes increased from 10 paisa to 23 paisa in the year 2018-19 and again decreased to 19 paisa in the year 2019. For every one rupee that the government receives, 16 paisa is budged to come from income tax. Receipts by way of Union excise duties have got reduced from 14 paisa to 8 paisa in the year 2019-20. Non tax revenues constituted about 8 to 10 paisa for every rupee that the government receives.

III. DIAGRAMMATIC REPRESENTATION OF HEADS OF GOVERNMENTAL REVENUES (2017 TO 2019)
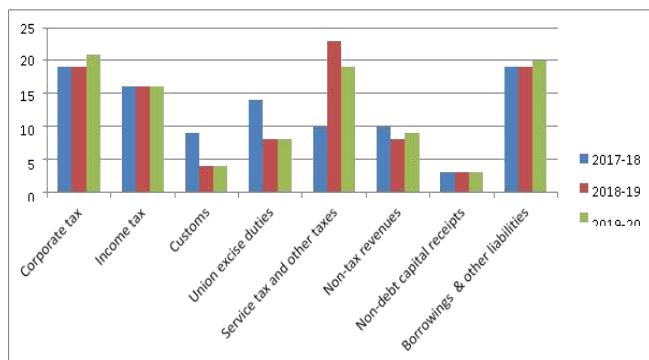
Heads of Governmental Expenditure: Considering the heads of government expenditure, the major heads include the State's share of taxes and duties, Finance commission & other transfers, Subsidies, Defence expenditure, Interest payments, Central sector schemes, Centrally sponsored schemes, Other expenditure and Pensions.

V. PATTERN OF HEADS OF GOVERNMENTAL EXPENDITURE (2017 TO 2019)

Heads of Governmental Expenditure	2017-18	2018-19	2019-20
States share of taxes and duties	24	24	23
Finance commission and other transfers	05	08	07
Subsidies	10	09	08
Defence	09	09	09
Interest payments	18	18	18
Central sector schemes	11	10	13
Centrally sponsored schemes	10	09	09
Other expenditure	13	08	08
Pensions	-	05	05
Total	100	100	100

Out of the rupee the central government spends, about 24 paisa was budgeted for giving away to different states their share of taxes and duties. This is one major receipt to all the state governments. The budgetary allocation for this head got reduced to 23 paisa for the year

2019-20. Between 5-8 paisa was budgeted for finance commission and other transfers from 2017-20. The budgetary allocations for subsides got decreased from 10 paisa for the year 2017-2018 to 9 paisa for the year 2018-19 and to 8 paisa for the year 2019-20. About 9 paisa was allocated for defence expenditure during all the years. The government also borrows. As a result the need for the interest payment arises. The budgetary allocations for the payment of interest stood at 18 paisa for all the three fiscals. Central sector schemes and centrally sponsored schemes accounted for 21 paisa during 2017-18, 19 paisa for the year 2018-19 and 22 paisa for the fiscal 2019-20, other expenditure and pension stood at 13 paisa for all the three years.

VI. DIAGRAMMATIC REPRESENTATION OF HEADS OF GOVERNMENTAL EXPENDITURE (2017 TO 2019)
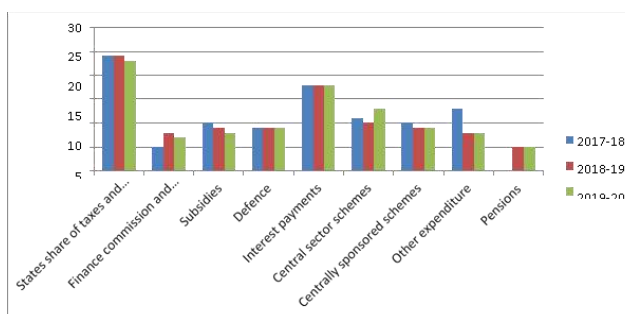
To conclude, budget is the economic policy of the union government for the coming fiscal year. It chalks out the direction in which the economic and business activities should happen in the country. It

assumes importance in the backdrop that through the budgetary exercise the central government, allocates its precious resources among different alternatives of expenditure. It pushes hard to create employment opportunities and eliminate poverty in the country. It strives for equitable redistribution of wealth and will aim at reducing disparity of income. It's another focus will be on maintaining price stability and working on refining the tax structures. An analysis of the proportion of governmental revenues and expenditure on different heads between 2017-19 does not reveal major change. However, there is a need to decrease borrowings thereby reducing the interest payments and channelizing the same for the developmental activities.

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Corporate Social Responsibility in Times of Economic Slowdown: Contribution and Trends by Corporate India

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ABSTRACT

Ever since the mandate that companies must adhere to some basic norms of corporate social responsibility (CSR), organizations have become conscious to the idea of giving back to society wealth both tangible and intangible. With the passage of Companies Act, 2013 there has been a force of legislation and law for every company to contribute. This should actually help increase the spending of company on development initiatives. We try to look at the secondary data to analyze how much corporate has been spending to provide impetus to the act in letter and spirit. The purpose of this paper is to analyses the spending patterns of companies within the public and private domains and also decipher the spending across sectors especially during the economic slowdown.

Keywords: Corporate Social Responsibility, Companies Act, 2013, Social Responsibility

I. INTRODUCTION

Corporate social responsibility (CSR) has become the talk of the town because it is now mandated by the Companies Act, 2013 under section 135. There must be a policy for the CSR in every company and allocation towards the same is compulsory. Whatever be the intention, putting CSR within a legal framework has provided teeth for such activities. Now, organizations cannot fooled around but seriously consider putting their best foot forward to support the cause of CSR. Nonetheless one must note that the idea of CSR is not new but has been a regular feature of all progressive societies (Wang, 2013).

The evolution of CSR is important to understand the scope of CSR. Most of today's biggest institutions in the education, health care and even automobile industry have been a result of charity. Before 1950, most of the CSR activity has been happening due to large hearted individuals contributing in large measure. This can be cited as a philanthropic era, but voluntary. In the 1960's and 70's the perception moved towards bringing awareness to corporate and business houses their responsibility towards community affairs. The following decades were largely concentrating on companies being responsible to the affairs and issues of society such as urban decay, racial discrimination and pollution problems. (Carroll, 2008).

II. REVIEW OF LITERATURE

Corporate social responsibility has been growing in recognition for quite some time as a contingent concept. The current literature suggests that CSR is concerned with responsibility of business in connection to the actors in society and it needs to be studied and practiced in such a manner (Davidson, 2016). Many studies in the past have focussed more on western and developed countries with respect to the CSR activities. Theoretical models have for long neglected the developing countries such as India and China (Jamali and Karam, 2016).

In our paper, we wish to understand the extent to which the private and public sector have contributed to the concept of CSR and have they

really implemented it in letter and spirit. When it comes to charity or giving back, Indian corporate has generally lagged behind its western counterparts.

III. RESEARCH DESIGN

For the purpose of this study, we have set an objective to find out the numbers by which corporate India has involved in CSR activity. The data has been collected from the MCA 21 Online portal for corporate affairs. The data has been purely secondary.

V. ANALYSIS

S no	COMPANY	CSR Spent in Crores (INR)
1	RELIANCE INDUSTRIES LIMITED	652.0
2	NTPC LIMITED	491.8
3	OIL AND NATURAL GAS CORPORATION LIMITED	421.0
4	TATA CONSULTANCY SERVICES LIMITED	294.2
5	SOUTH EASTERN COALFIELDS LIMITED	270.9
6	ITC LIMITED	247.5
7	CENTRAL COALFIELDS LIMITED	212.8
8	NMDC LIMITED	210.1
9	TATA STEEL LIMITED	204.5
10	INFOSYS LIMITED	202.3

Source: www.mca.gov.in

Table 1: Top ten companies in CSR spending during 2015 – 16
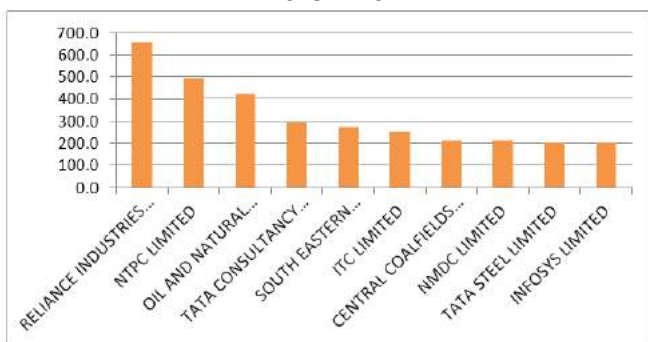
Figure 1: Top ten companies in CSR spending

Table 2: Contribution from the top 5 companies

S no	COMPANY	CSR Spent in Crores (INR)
1	RELIANCE INDUSTRIES LIMITED	652.0
2	NTPC LIMITED	491.8
3	OIL AND NATURAL GAS CORPORATION LIMITED	421.0
4	TATA CONSULTANCY SERVICES LIMITED	294.2
5	SOUTH EASTERN COALFIELDS LIMITED	270.9

Source: www.mca.gov.in
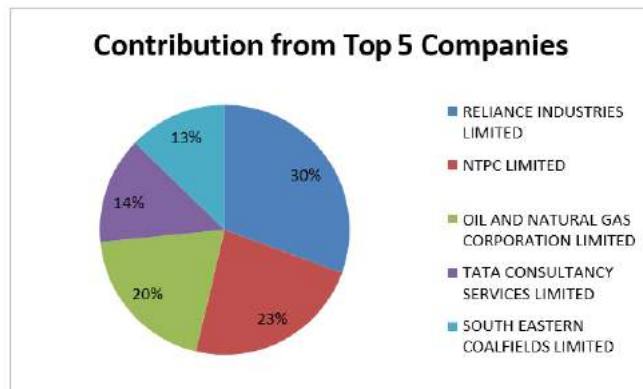
Table 3: Comparison of Contribution

COMPANY	CSR IN CRORE	
	2014-15	2015-16
RELIANCE INDUSTRIES LIMITED	652.0	760.6
NTPC LIMITED	491.8	495.2
OIL AND NATURAL GAS CORPORATION LIMITED	421.0	239.5
TATA CONSULTANCY SERVICES LIMITED	294.2	214.1
SOUTH EASTERN COALFIELDS LIMITED	270.9	210.4
ITC LIMITED	247.5	205.2
CENTRAL COALFIELDS LIMITED	212.8	188.7
NMDC LIMITED	210.1	171.5
TATA STEEL LIMITED	204.5	156.0
INFOSYS LIMITED	202.3	133.3

Source: www.mca.gov.in
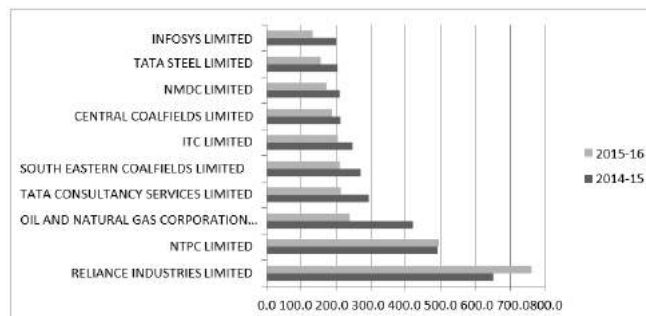
Figure 3: Comparison of Contribution

VI. FINDINGS

According to table 1 it is evident that most companies in the space of Oil and natural gas have been highly contributively as far as corporate social responsibility is concerned. For instance the top five companies are Reliance, NTPC, ONGC and Southern Eastern Coalfields. Table 3 compares their two year contribution. It is rather satisfying to see an increase in their provisions. Among the IT companies, Tata Consultancy services (TCS) are taking a lead in contributing massively for the CSR, followed by Infosys. We can note that among the Tata Sons, there are two companies TCS and Tata Steel that are seen as top contributors.

Five of the top ten companies are public sector companies. This indicates that Public sector

companies are leading from the front, and it is also heartening to see 50 % contribution from the private sector. ITC is right in the middle, but its contribution is also increasing over the two years.

VI. DISCUSSION

Grigoris and Theotokas (2011), in the study on effects of financial crisis in corporate social responsibility found from a survey of 120 odd companies that, companies tend to increase the corporate social responsibility budgets and attention, in order to regain the lost trust from the markets. They concluded that companies were actually more proactive during the economic distress and financial troubles in order to keep alive animal spirits.

Yaesmain (2010) examined the effects of financial crisis on the number and extent of CSR projects. It was found that there has been a significant drop in numbers and extent of projects undertaken under the CSR head during the financial crisis. This study became a landmark in initiating a discussion on CSR and they ways they are affected during the financial crisis.

Cheney et al (1990), was a pioneering study on bringing discussions regarding CSR and conservative approach firms adopt during tough financial times and fail to meet the expectations of related parties.

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Right to Education Act-Challenges & Recommendation

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ABSTRACT

The right to education is one of the human rights, The right to education is written in Article 26 of the 1948 Universal Declaration of Human Rights .Education encourages us to supports monetary development, advance harmony in the general public, bring great administration, expel defilement, annihilate neediness, evacuate sexual orientation separation and imbalance ,causes us in making self-ward . Right to education is perhaps the best Act; our legislature has ever brought and changed youngsters into understudies. It gave a chance to the kids who can't stand to contemplate. Elementary education got fundamental under this Act. This paper attempts to investigate the status of mindfulness and the difficulties engaged with the usage of RTE, there isn't a lot of weaknesses yet some alteration will guarantee better eventual fate of the whole country and furthermore prescribe the legislature to mediate to reinforce the RTE demonstration.

Keywords: Education, Right To Education Act, No Detention Policy, Student Growth

I. INTRODUCTION

The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) is an Act of the Parliament of India authorized on 4 August 2009, which depicts the modalities of the significance of free and obligatory training for kids somewhere in the range of 6 and 14 in India under Article 21a of the Indian Constitution. India was one of 135 nations to make education a principal right of each youngster when the Act came into power on 1 April 2010.

The Supreme Court of India saw that notice of 'life and personal liberty' in Article 21 of the Constitution consequently infers some different rights, those are important for the full improvement of the character, however they are not identified in Part III of the Constitution. Training is one such factor liable for generally speaking improvement of an individual and along these lines, right to education is coordinated in Article 21 of the Constitution.

"Education is the most powerful weapon which you can use to change the world"

Nelson Mandela

II. CHRONICLED BACK GROUND OF RIGHT TO EDUCATION

Article 26 of Universal Declaration of Human Rights broadcasts-

(1) Everyone has the right to education. Education will be free, in any event in the rudimentary and basic stages. Elementary education will be obligatory. Specialized and proficient instruction will be made commonly accessible and advanced education will be similarly available to all based on merit.

(2) Education will be coordinated to the full advancement of the human character and to the fortifying of regard for human rights and central opportunities. It will advance getting, resilience and kinship among all countries, racial or strict gatherings,

and will promote the exercises of the United Nations for the upkeep of harmony.

3) Parents have an earlier right to pick the sort of training that will be given to their kids.

Exertion is made by our Indian Constitution to guarantee that the State gives training to every one of its residents. According to the 86th Constitutional Amendment Act 2002 included Article 21A made mandatory Education for kids between the ages of 6 to 14 years, where the Government has been doled out the obligation to give free and necessary training which is referenced in part III of Fundamental Right and partially IV of Directive Principles of State Policy , Art 45 clause(k) states that ,The States will attempts to give, inside a time of 10 years from the beginning of this Constitution, free and obligatory instruction for all youngsters until they complete the age of 14 years.

The Right to Education of people with handicaps until 18 years old is set down under a different enactment - the Persons with Disabilities Act. Various different arrangements with respect to progress of school framework, instructor understudy proportion and staff are made in the Act.

"The RTE Act is the principal enactment on the planet that puts the duty of guaranteeing enrolment, participation and culmination on the Government. It is the guardians' duty to send the youngsters to schools in the US and different nations."

86th Constitutional revision in 2002, which proclaimed Education an essential right all things considered in the age-gathering of 6-14, in 2008, the Union Cabinet stepped its seal of endorsement on it and it was put before the Rajya Sabha which passed it in July 2009. The bill at that point continued to the Lok Sabha, where it was passed in August 2009. The Right of Children to Free and Compulsory Education Act, 2009 (RTE Act) has a long and checkered history. The Right to Education was examined broadly during the drafting of the Constitution. The Constituent Sub-Committee on Fundamental Rights incorporated the Right to primary education as a fundamental right. Anyway the Advisory Committee of the Constituent Assembly dismissed this proposition and put it in the class of non-justifiable

fundamental rights (later known as Directive Principles of State Policy). The primary authority suggestion for the consideration of a crucial right to training was made in 1990 by the Acharya Ramamurti Committee. From that point, a few political just as arrangement level changes affected the course of free and compulsory education. The nation saw an expanded worldwide spotlight on its drives with respect to free and compulsory education after its investment in the World Conference on Education for All in 1990. India additionally confirmed the United Nations Convention on Rights of the Child in 1992.

'Right to life' is the concise articulation for each one of those rights which the courts must implement since they are fundamental to the noble delight throughout everyday life. It stretches out to the full scope of lead which the individual is allowed to seek after. The privilege to instruction streams legitimately from right to life. The right to life under Article 21 and the nobility of an individual can't be guaranteed except if it is joined by the privilege to instruction. The State Government is under a commitment to make attempt to give instructive office at all levels to its residents.

In 1993 the Supreme Court limited the ambit of the major right to training as propounded in the Mohini Jain case the Court saw that:

The Right to education which is understood morally justified to life and personal liberty by Article 21 must be translated in the light of the mandate standards in Part IV of the Constitution. So far as the privilege to training is worried, there are a few articles in Part IV which explicitly talk about it. Article 41 says that the "State will, inside the points of confinement of its monetary limit and improvement, make viable arrangement for tying down the privilege to work, to training and to open help with instances of joblessness, mature age, sickens and disablement, and in different instances of undeserved need". Article 45 says that "the State will attempt to give, inside a time of ten years from the initiation of this constitution, for nothing and necessary instruction for all youngsters until they complete the age of fourteen years". Article 46 directions that "the State will advance with exceptional consideration the instructive and monetary interests of the more fragile segments of

the individuals, and, specifically, of the Scheduled Castes and the Scheduled Tribes, and will shield them from social treachery and all types of misuse.

The three Articles 45, 46 and 41 are intended to accomplish the said objective among others. It is in the light of these Articles that the substance and parameters of the privilege to training must be resolved. Right to training, comprehended with regards to Articles 45 and 41, Means: (an) each kid/resident of this nation has a privilege to free training until he finishes the age of fourteen years and (b) after a kid/resident finishes 14 years, his entitlement to instruction is encompassed by the points of confinement of the financial limit of the state and its advancement.

In 2002, the 86th amendment to the Constitution presented Article 21-A creating the Right to Education a fundamental right. Without precedent for free India's history a fundamental right had been added to the Constitution. Dissimilar to other central rights the Right to Education required an empowering enactment to get powerful.

A long time back in India likewise, in 1937, Mahatma Gandhi voiced the requirement for widespread instruction. Later in 1950, Constitution of India, in the 'order standards of state arrangement', expressed that "All states will attempt to give inside 10 years of beginning of constitution free and mandatory instruction to youngsters till they arrive at the age of 14 years." In 1976, training turned into a simultaneous subject for example a joint obligation of state and focus. Another significant strategy change came in 1986 through National Policy on Education (NPE), which characterized and prescribed Universal Elementary Education (UEE). The greater part of these arrangements were neither enforceable not justicieable and stayed a long way from accomplishing their objectives. It was distinctly in 2002 that instruction was made a central right in the 86th amendment to the Constitution. Before August 2009, 'instruction' was considered as a Directive Principle, and in the wake of passing it in both the places of Parliament, on September third 2009 it turns into a law and a Fundamental Right.

On first April 2010, India joined a gathering of 137 nations on the planet, with a memorable law making instruction an essential right of each youngster coming into power. The striking highlights of Right to Free and Compulsory Education are given in the Gazette of India (unprecedented) distributed by the Ministry of Law and Justice. Making basic training a qualification for youngsters in the 6-14 age gatherings, the Right of Children to Free and Compulsory Education Act, 2009 will straightforwardly profit kids who don't go to class at present.

III. RESEARCH METHODOLOGY

This paper is essentially graphic investigative in nature. In this paper an endeavour has been taken to break down the Education in India. The information utilized is from auxiliary sources as per the need of this investigation, gathered the information from various sites.

V. CHALLENGES

Awareness

Right to Education is another privilege remembered for our fundamental rights. The first and the premier know, Due to this the adolescence of India doesn't get chance to get training and is occupied with numerous in human practices.

In 2019, ASER(Annual Status of Educational Report)aims to shine the spotlight on the early years, reporting on the schooling status as well as on a range of important developmental indicators for young children in the age group 4-8.

In India, there is little proof on scale as for whether small kids approach pre-essential offices and whether they are obtaining the primary aptitudes and capacities that are vital to consequent accomplishment in school and past. Further, guardians, families, network individuals and others are not in every case clear about the various types of capacities that can enable small kids to adapt to the requests both of scholarly learning and of regular daily existence.

Nonetheless, so as to guarantee that the requirements and capacities of little youngsters move into the centre of current discussions on instructive arrangement and practice in India, the proof needs to address and be comprehended by an a lot more

extensive arrangement of on-screen characters – guardians just as approach producers, experts just as individuals on the loose.

Dynamic contribution of local bodies, networks, Parents, NGOs and Civil Society's

Local bodies, guardians, Civil Society's, can likewise contribute towards the Right to Education Awareness programs by benefiting the rights for more fragile area, ignoring of the reality of their financial foundation.

Financial Constraint

After the RTE Act, 2009 was authorized, SSA. (Sarva Shiksha Abhiyan) was subsumed under it. Where, RTE ensures the privilege to free and compulsory education for youngsters between the ages of 6 and14 years in a local school. . It has been seen that there exists a wide hole among request and real assignment for the SSA and RTE., For instance, the BE (Budget Estimate) for 2016-17 was Rs 22,500 crore as against the Department's solicitation for Rs 55,000 crore. The distribution of Rs 23,500 crores as spending gauge for 2017-18 is against an interest of Rs 55,000 crore. The assets ought to be reserved on need base.

Quality in Education

Some examiner are of the view that with RTE rather than advancement of training and guaranteeing the full school enlistment – that circumstance has gotten increasingly mind boggling and managerial as the schools proprietor care more to manage civil servants, who have the ability to close down the school, incase, school didn't finish the prerequisite that are written in the RTE. In numerous territories, the tussle between school proprietor and organization has been going on and the training status is the prey of this challenge.

No confinement Approach

Section 16 of the RTE demonstration expresses that 'No kid will be kept down or ousted from school till the fulfillment of basic training'. This issue came to under the watchful eye of a three-judge Bench of the Supreme Court in Society for Un-helped Private Schools of Rajasthan versus U.O.I., in which Justice Radhakrishnan had decided that "Keeping down in a class or ejection may prompt huge number of drop outs from the school, which will invalidate the very point and object of the Act, which is to fortify the

social texture of majority rule government and to make an equitable and sympathetic culture.

`The arrangement doesn't imply that understudies won't be surveyed. The Continuous and Comprehensive Evaluation (CCE) methodology will empower the instructor to survey the youngster's adapting way, however states have actualized The Continuous and Comprehensive Evaluation (CCE) system in a mechanical nature.

No drop-out checks

A significant test is the huge number of kids who are out of school. Despite the fact that Right to Education Act is a crucial without the Coordination between Various Implementing Agencies the motivation behind the Act won't be served. Each and every other day we see youngsters working at roadway cafés, in individuals' homes, on the streets, in tea slows down, vehicle carports and workshops. To lift these youngsters up and put them in school is scarcely as simple as it sounds. Regardless, salvage of kid workers and rebuffing the business is crafted by the Labor Ministry and the police. The obligation of carrying youngsters to schools and giving them quality instruction is crafted by the Human Resource Development Ministry. Of course, observing execution of the RTE Act is the duty of the youngsters rights commission in each state, which is under the Women and Child Development Department. Starting at now, not all states have even informed the RTE rules. It is vital accordingly that the endeavors of every one of these offices are facilitated for the bigger objective of giving instruction to all youngsters to turn into a reality.

Nature of educator

Despite the fact that the Act accommodates the improvement of educational program with the worth revered in the Constitution, which guarantee for the inside and out advancement of the kid. Except if and until they are prepared to make remedial move as the law recommends with respect to CCE (Continuous and Comprehensive Evaluation, the Act can't satisfy its objective

Arrangement for Secondary Education

There is no enactment which commands free and mandatory optional training. Right to Education Act constrains the age bunch from 6-14 and to access to

auxiliary school isn't simple where for each three upper grade schools there is one optional school.

Discriminatory

The act has been criticised as discriminatory for not addressing the issues, Children attending the private schools are seen to be at an advantage, forming a discrimination against the weakest sections who are forced to go to government schools.

The demonstration has been scrutinized as biased for not tending to the issues, Children going to the private schools are believed to be at a bit of leeway, shaping an oppression the weakest segments who are compelled to go to government schools.

Boundary for orphans

The Act provides for admission of children without any certificate.. In any case, a few states have proceeded prior methods demanding orphan kids produce document. However, orphan children are frequently incapable to deliver them. As a result,schools are not conceding them, despite the fact that they are willing to do so.

VI. RECOMMENDATIONS

For quality instruction to genuinely arrive at each youngster in the nation, it is vital that the accompanying advances are taken:

1. As far as possible the age to 6 to 14 the state Government can make essential arrangement for a privilege to early youth care and the idea of pre-school instruction should be inspected in incredible detail.

2. Endeavors ought to be made to bring the youngsters over the age gathering of 14 in the ambit of this Act, by reporting grant to the exemplary understudies who can't bear the cost of private schooling.

3. The legislature ought to accommodate the foundation offices, to accomplish this, tremendous money related assets is required, for that there ought to be a reasonable boundary between the obligations of focus and state.

4. There is a contention between the kid work and RTE Act, The quintessence of the enactment of youngster work is the emphasis of the arrangements of the RTE Act

5. The administration repayment should starts from kinder garden than from class 1 with the goal that guardians can concede the youngsters to kinder nursery than class 1.

6. There is an absence of value instruction, on the grounds that the administration focuses exclusively on the share while different regions of the Act are to a great extent disregarded.

7. Instruction Department should direct competency test to evaluate the aptitude, quality and shortcoming of understudy in class 1 to class 8 and furthermore to prepare educator to adjust exercises and encouraging style agreeing, many complete primary school, yet need central ability.

8. Numerous children drop from schools after the elementary period time frame so Compulsory advanced education plans must be shrouded in this Act, where the dropout youngsters ought to be given aptitude preparing programs as opposed to compelling a grown-up in doing mandatory courses. Because somebody couldn't ponder or get things done at a youthful age, doesn't mean they botched the opportunity to change vocations or ability themselves when they have enthusiasm to gain the switch by endeavors.

9. Mindfulness program ought to be sorted out by the State to cause the kids to understand their Educational right and furthermore the Community mindfulness on the Act in like manner should be developed further.

10. The privileges of youngsters to training additionally implies advancing and securing different rights, for example, the limitations on kid work, and assurances for minorities and dislodged people and furthermore from monetary misuse and from playing out any work that is probably going to be unsafe or to meddle with the kid's instruction, or to be hurtful to the kid's wellbeing or physical, mental, profound, good or social improvement. The Government should execute suitable authoritative, ,

managerial, social, and instructive estimates where the kid will be shielded from youngster work and from the networks and families that are relied upon kid work.

Consequently, a Community Driven Education System fills in as a viable component in advancing training. The basic reason is that, if instruction is made the obligation of the individuals, for whom the administrations are given by the administration, at that point the proposed targets can infiltrate the network and objective of 'training for all' can be accomplished. Essentialness of Community Participation, The job of network in school training can be tremendously significant. Network interest can prompt more prominent preferences, as far as improved school execution, diminished dropout rates, a lessening in carelessness with respect to the school and an increasingly positive . The people group are the best arrangement of gathering who can assume a significant job during the time spent changing instruction.

VI. CONCLUSION

Right to Education is perhaps the best demonstration, our legislature has ever presented. It gave a chance to the youngsters who can't bear to think about. Basic training got essential under this Act yet constrained advances have been taken to improve quality in schools and furthermore the openness to all is a question mark. In any case, in the greater part of the creating nations of Asia by and large and India specifically, however the significance of instruction is felt, it has not been given the due thought that is required for bringing the Constitutional commitments into the real world. Earnest endeavors ought to be made to accomplish the objective. No single association can address every one of the worries identified with the execution of the RTE Act, yet it tends to be done through community oriented endeavors. The steady checking and solid political will is an absolute necessity to make it viable

Total Quality Management – An approach to Improve Higher Educational institutions

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ABSTRACT

Higher Educational Institutions plays a pivotal role in socio economic development of any country. Paradigm shift in knowledge dispersion, dissemination leads to the need of assured quality in higher educational institutions. The paper strives to identify the approaches of TQM that can be implemented through long term planning towards continuous improvement of higher educational institution. TQM is customer focus approach involving management for detecting and eliminating error emphasizing upon process and product sphering around each and every element of an organization. The paper is based on an extensive research conducted on previous work done in the aligning areas of quality improvement in educational institutions. The prime outcome of the paper is to provide guidelines related to implementation of quality improvement approaches towards higher educational institutions

Keywords: Higher Education, Total Quality Control

I. INTRODUCTION

Higher education institutions play a vital role in growth and socio-economic growth of any country. The proliferation of higher education institutions abides by norms, rules and other organisational factors reviewed through various accreditation committees stimulates quality improvement. Maintaining and improving Quality aspects in Higher Education Institutions (HEIs) is crucial in order to remain competitive in the business of education (Venkatraman, 2007). HEIs are responsible for paving the learning and delivery methods for future generations to survive with the challenges of sustainable development (Khan and Matlay, 2009).The pressure faced by higher educational institutions in order to update the curriculum to make students more employable as well as accommodating changing market situations and face competition globally. According to Ronald

Barnett (1992) Higher educational institutions (HEI) play a monumental role in contributing qualified human resources accelerating growth and development of business industries, preparing for qualified scientists and researchers who would continuously develop the frontiers of knowledge and meet the need of all segments of society (Khorasgani, 2008). HEI focus on efficient management of teaching-learning provisions by improving the quality of teaching, enabling a higher completion rate among the students. (Sudha,T,2013) . Education revolves around the challenges of globalisation, student migration and changes in curriculum and delivery, the concept of quality is becoming an integral part in education system in order to make the recipient more employable. Total quality management is an approach involving all elements of an organisation processes, practices, systems, methodologies and of all stakeholders involved or damage in any way the quality of

product or service. (Stanciu, I, 2003) .. Quality education is the process of enhancing intellectual growth and development by adding value to student's knowledge, skills, and techniques and in return add value to the society. HEIs have a unique culture which hinders rapid change and limits their readiness to change (Angehrn and Maxwell, 2008), but they exist in an environment which is dynamic influencing the nature of work , increase competition certain improvement initiatives, quality awards, internal and external stakeholders needs, technological advancement and globalization (Anderson and McAdam, 2004).In this essence, quality has become one of the most important concerns of HEIs (Mehralizadeh et al., 2007). Researchers have pen down meanings of quality according to Crosby (1979) is known for the concept of "Zero Defects", while Juran and Godfrey (1999) define quality as "fitness for purpose".Deming (1986) define quality as "a predictable degree of uniformity and dependability at low cost and suited to the market".Approaches. One of the approaches suitable for dealing with HEIs challenges and enabling organisations to adapt by improving their overall processes is Total Quality Management.

TQM is a management philosophy originated in the 1950s and became popular in next three decades. Manufacturing sectors are the pioneers in implementing. Gradually it spread across to service sectors including healthcare, banking, insurance, non-profit organisations and educational institutions. TQM is viewed as a social solution as well as a scientific model: The two key Pillars are the use of scientific data to bring the customer experience into the process of business negotiations and emphasis on customer experience in the continuity of business operations TQM highlights a belief that views an organization as a collection of processes and maintains that business must strive to improve each process (continuously) to meet the consumer needs. Essentially, TQM is based on a business philosophy that emphasizes on standards in all aspects of work. Mistakes can happen due to people or process but business should make effort to fix such problem by tracing root causes and removing them from the management process, and repetition can be prevented by changing the process. The main objective of TQM is to foster a climate of creativity and efficiency in which all the resources

are used. TQM models based on teaching of quality gurus, generally involve a number of principles such as teamwork , top management leadership, customer focus, employee involvement , continuous improvement tool, training, etc,(Murad,A., Rajesh,K, 2010).Synergistic collaboration between various elements of education system (faculty: students, Industry: Faculty and students: Industries) assures the strategic quality among various combinations are required.

Figure:1 TQM seen as a continuously evolving management system consisting of value, techniques, and tools.(After Hellsten,H., Klefsjo,B., 2000)

Figure: 2 Steps involves in TQM process
Success in TQM implementation lies in Strive for continuous improvement through owner/customer satisfaction and employee satisfaction , Recognize the need for measurement and fact-based decision making , Involvement of employee for companies overall improvement , Train employee to perform better, Work hard at improving communication inside and outside the company ,Use teams of employees to improve processes ,Place a strong emphasis on the right kind of leadership. Involve subcontractors and suppliers in continuous improvement (Sunil Kumar, Business technology , Slide share)

II. LITERATURE REVIEW

Education is a phenomenon of converting tangible resources into intangible resources. The educational outcome is difficult to measure as it results in transformation of individual's knowledge attitude

behaviour (Hwarng and Teo). Many researchers have tried to provide a benchmarking parameter to assess quality standards to educational institution by focusing on building flexibility and improving customer satisfaction in a dynamic environment. Sahney et al. (2004) consider education system as a transformation process comprising of inputs of students, teachers, administrative staff, physical facilities and process. The process includes teaching, learning, and administration. An output includes examination results, employment, earnings and satisfaction. Ho and Wearn (1996) developed TQM quality measurement model for Higher Education (HETQMEX).Ho and Wearn elaborated the need of TQM (Total Quality Management) for maintenance of Quality in HEI. A generic mission statement of HEI should mention about providing quality education, research and related services to continuously satisfy stakeholders" needs and achieve excellence through TQM". Any organization can improve their management of higher education by emphasizing values regarding the importance of people, knowledge and continuous improvement (Sherr& Lozier, 2006). TQM believes focusing on the right issue to be on the right track to success. Black and Porter (1996) place emphasis on Baldrige Award criteria, revealing ten critical factors for the successful implementation of TQM, and these factors are: supplier partnership, People and customer management, customer satisfaction orientation, external interface management, communication of improvement information, strategic quality management, operational quality planning, quality improvement measurement systems, teamwork structure for improvement, and corporate quality culture. As stated by Samat, et al. (2006) TQM has been explained by many scholars as „the most global advanced approach in the area of quality". TQM provides consumer loyalty and profitability to the organization. Ho and Wearn (1996) basically applied the Quality management process on the UK Higher Education Industry and explained the factors and organizations associated with the maintenance of quality in it and concluded the presence of TQM in service quality is essential. The elements of TQM identified are leadership, commitment, total customer satisfaction, continuous improvement, total involvement, training and education, ownership of problems, reward and recognition, error prevention, and teamwork".

Owlia and Aspinwall (1996) present a conceptual framework that covers six criterions to depict quality dimensions. These dimensions are indicative of the areas that should be of concern to ensure quality in higher education.

Table 1 Quality dimensions in higher education

Dimensions	Definition in higher education
Responsiveness	Willing and readiness of staff to help students
Reliability	The degree to which education is correct, accurate and up to date
Understanding customers	Understanding students and their needs
Access	The extent to which staff are available for guidance and advice
Competence	The theoretical and practical knowledge of staff and other presentation skills
Courtesy	Emotive and positive attitude towards students
Communication	How well the students and lecturers communicate in the class
Credibility	The degree of trustworthiness of institution
Security	Confidentiality of information
Tangible	State, sufficiency and availability of equipment and facilities
Performance	Primary knowledge/skills required for graduates
Completeness	Supplementary knowledge/skills, use of computer

Source: Owlia and Aspinwall (1996)

Dimensions	Characteristics
Tangibles	Sufficient equipment / facilities
	Ease of access
	Visually appealing environment
	Support services (accomdation, sports...)
Competence	Sufficient staff(Academic)
	Theoretical and practical knowledge, qualifications
	Teaching experience, communication
Attitude	Understanding students needs
	Willingness to help
	Availability for guidance and advice
	Giving personal attention
Content	Relevance of curriculum to the future jobs of the students
	Communication skills and team work
	Flexibility of knowledge, being cross-disciplinary
	Containing primary knowledge/skills
Delivery	Effective presentation
	Sequencing, timeliness
	Consistency, fairness of examinations
	Feedback from students
Reliability	Trustworthiness
	Giving valid award
	Handling complaints, solving problems

Ahire et al, (1996) expanded the practices even further and identified 12 factors that are critical for the implementation of TQM derived mainly from the literature, these factors are: Top management commitment, Customer focus, Supplier quality management, Design quality management, Benchmarking, use of statistical process control, internal quality information, Employee empowerment, Employee involvement, Employee training, Product quality, and Supplier performance. In implementation of TQM in higher education teamwork is one the most important factor so responsibilities and also roles of team members should be well defined (Xyrichis A, Ream E , 2008). Higher Education institutions to develop its own internal Quality management has become a reality. (pratasavitskaya and Stensaker, 2010). TQM is a Holistic approach towards achieving quality aspects of any educational institutions.

III. RESULT AND DISCUSSION

The key components were management commitment, customer orientation, employee involvement, and continuous improvement. Customer for HEI are Students, Parents , Alumni and also industries where students were placed .A suggestive TQM model to achieve excellence in quality is developed for HEI. The components identified and description in brief is provided below.

1. Commitment of top management: HEI Top management comprises of Chairman, Principal Deens. Head of the departments, registrar, Chancellor. Primary responsibility includes monitoring, decision making for future course of action in order to implement changes required to maintain quality standards.

2. Course delivery: With in a department a body of subject experts need to be formed. Mode of delivery(predetermined methods like cases videos presentation, debate, role play etc), content to be covered examples to be citied need to be predetermine and adequate measures to ensure the timely completion of curriculum through lesson plan. Adequate training to use technology and Faculty development program to enhance the subject content and enlightened the changes subjectarea. Regular classroom observation will help faculty to improve content delivery and give adequate feedback.

3. Infrastructure facilities: Utmost attention is to be shown in providing excellent infrastructure and physical facilities in the campus for student learning, co-curricular and extra- curricular activities. Classrooms embedded with audio video provisions, wifi enabled campus, Digital library, discussion rooms, video conferencing hall, auditorium,specious library, open area for discussions , canteen facilities ,recreational centres , open gym

4. Interaction: A positive and emotive attitude towards students by each member of HEI will lead to congenial learning environment. This includes Counsellors guiding for admission, accounts staff receiving payment and guiding students about the procedure to be followed in the course of action for making payment, Teaching and non-teaching staff , faculties from examination department

5. Customer feedback and improvement: Constant feedback from the students leading to continuous improvement in the process is the key to achieving excellence. Feedback from industries where students are placed regular interaction with industry to mend the gap with industry and academics.

The higher Education system needs to be strengthened in order to hone attainment of all-round, multifaceted personality: leadership qualities, communication and interpersonal skills, knowledge of the latest trends in technology, to have exposure to industrial climate. HEI has a big role to play in overall development of any nation and approaches like TQM become must in today's competitive scenario.

1. Preparation for implementing changes:
2. Training and education to faculties and other employees: The institution must devise training and development programmes Faculty development program, new technology embedded programme , behavioural training , Performance management to educate and equip faculties/employees, guiding them to carry on their work such that they will support the institution in meeting its goals thereby achieving quality.
3. Initiative: Top management should assign people role and responsibility to bring whole organisation together and implement the change. Individual targets are assigned, and benchmark can be used as effective tool for successful implementation.
4. Evaluation: The HEI must evaluate its performance quarterly or half yearly (after the semester) in order to monitor the progress and identify the obstruction to achieve quality outcome and future course of action can be decided.
5. Recognition: Recognition of teaching and non-teaching staff those who have contributed need to be motivated either through monetary /non-monetary reward system.
6. Continuous Improvement: TQM is a continuous process. And changes need to be incorporated looking into the need of society, industry and individual students. the process needs to continue with one dedicated team to define quality requirement and bring change accordingly.

VI. CONCLUSION

The Success of any quality approach depends on HEI strategy and commitment towards the quality

aspect. Goals need to be identified and corresponding changes need to be implemented Kurt Lewin theorized a three-stage model of change namely unfreezing-change-refreeze can act as guideline for implementing change it will help organisation to achieve desired objective .TQM is a continuous process and changes need to be incorporated looking into the need of society, industry and individual students. TQM is a concept which need time to get into organisation culture. Definitely organisation is going to benefitted. But HEI need to Analyses and understand the obstruction identify and divide role and responsibility and key people driving the change leading to beneficial quality educational system to serve society and country. Further future detailed research is suggested in order to upgrade the indicator used for Quality assessment in future.

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Influence of Two Stage Stir Casting and 6 wt.% Boron Carbide Particulates Addition on Mechanical Characterization and Wear Behavior of Al2618 Alloy Composites

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ABSTRACT

In the current research the production of composites, characterization, mechanical and wear behavior of 6 wt. % of micro composites have been investigated by reinforcing the 63 micron B4C ceramic particulates into Al2618 alloy. The composites were prepared by using two stage stir casting technique containing Al2618 alloy as matrix phase and B4C particulates as reinforcement. After the composite preparation, the prepared composite material was examined by using various techniques like SEM, EDS and XRD for characterizing the chemical elements and microstructures of reinforced and unreinforced material. Later, the mechanical properties and wear behavior of as cast Al2618 alloy and Al2024 -6 wt. % 63 μm B4C composites were studied. Different mechanical properties like hardness, percentage elongation, ultimate and yield strength were evaluated as per the ASTM standards. The dry sliding wear tests were conducted by using pin on disc equipment. The experiments were conducted for the sliding distance of 3000 m by varying the sliding speed and load. From the investigation, it was found that due to addition of nano B4C ceramic particles in the Al2618 alloy matrix the hardness, ultimate tensile strength and yield strength of prepared composites by stir casting were increased and the percentage elongation was decreased of the same prepared composite. Further, there was an improvement in the wear resistance with respect to the speed, load, and sliding distance for the prepared composite materials. However, with the addition of B4C ceramic particulates in the base Al2618 matrix the wear loss was decreased. The scanning electron microscope was used to study and analyze the fractography and different wear mechanisms for various test conditions of different compositions, tensile fractured surfaces and the worned surfaces.

Keywords : Al2618 Alloy, 63 μm B4C, Stir casting, Mechanical Behavior, Fractography, Wear, Worn Morphology

I. INTRODUCTION

In the modern technology the micro metal matrix composites plays a very crucial role in various application. Usually to enhance the ultimate strength or better yield of the metals the nano ceramic particles are used. But however, the ductility of nano metal matrix composites deteriorates with respect to

strength by the absorption of high ceramic particles. Therefore, the ceramic particles can be significantly substituted in the place of macro particles [1].

As compared to other alloys and conventional metals, aluminum alloys are used as matrix phase in various ranges of domains like automobile, aerospace, and marine industries owing to their different physical properties like low density, good corrosion resistance, low thermal coefficient of expansion and finally the cost of production is relatively low [2, 3]. Due to these characteristics' aluminum alloy forms a very strong and good competitor in broad range of applications. But however still some of the major mechanical properties like elastic modulus, strength and wear resistance are not very much satisfactory for industrial applications; therefore, to meet the satisfactory requirements they are reinforced by various ceramic reinforcements such as B4C, SiC, graphite, etc. So as compared to other micro particles, B4C ceramic particles used as reinforcement as made a better significant choice and have recently started been using in aluminum matrix composites by offering very high hardness, enhanced strength, chemical stability and increase in thermal stability [4, 5].

Micro metal matrix composites are gradually getting to be distinctly appealing materials for cutting edge aviation applications and yet their properties can be custom- made by the proper chose of reinforcement. Among three different composites, particulate strengthened MMCs as of late discovered unique intrigue on account of their quality and firmness at a normal room and raised temperatures. It is significant to note that the flexible properties of the metal matrix composites are unequivocally affected by

few secondary parameters of the reinforcement, for example, shape, size, introduction, circulation and volume.

B4C is one of the hard-ceramic reinforcement materials which tend to possess a low specific gravity, outstanding hardness and good high temperature melting point hence these properties make a best

choice of reinforcement material for nano metal matrix composites. Different applications like pulleys, linkages in automobiles, are prepared by using Al–B4C micro composites because of the hard nano particles it acts as interface for wear resistant applications [6]. For the manufacturing of nano metal matrix composites various fabrication techniques are commonly available, like powder metallurgy, high-energy ball milling, mechanical alloying, stir casting, nano-sintering, and spray-deposition. However mechanical stir casting process is considered as one of the finest technique due to the formation of vortex which leads to disperse of micro sized B4C particles in molten aluminium without forming clustering and agglomeration and relatively low-cost. With respect to fabrication processes the proper selection of several parameters are much needed, like stirring speed in rpm, time in minutes, preheating temperature of the mould, temperature of molten matrix in degree Celsius, along with the continues uniform feed rate of the nano ceramic reinforcement in steps of two stages into the molten matrix to acquire good wetting property. By using stir casting technique and producing of components with complex geometry in huge volumes at a lower cost of production is one of the advantages, but there are several dis-advantages like small blowholes and porosity because of the improper distribution of the nano ceramic reinforcing particles between the metal matrixes which leads to deterioration in various mechanical properties. However, this type of case occurs when the calculated volume of the reinforcement is more than the matrix phase [7]. As revealed so far by performed research, even at the superior temperatures the B4C particulates contributes in enhancing various mechanical properties. The matrix deformation is successfully prevented by the existence of B4C particulates, which holds the load and lock up the micro cracks that often build up along the friction direction.

But however, insufficient information is existing with regards to the tribological and mechanical properties of B4C particulates reinforced with

Al2618 which is processed by two stage mechanical stir casting method. The aluminum–B4C

composites play an important role in the industry because of the increase demand of advanced lightweight materials in different industrial applications. Keeping in view of the above observations, it is proposed to develop Al2618 composites with 6 wt. % of 63 µm B4C ceramic particulates.

II. EXPERIMENTAL DETAILS

Materials Used

The aluminum alloys are basically classified into two categories these are cast aluminum and wrought aluminum. In the present research work Al2618 alloy is used as the matrix material which is one type of wrought aluminium alloy designated by 4 numbers, having copper as the primary element and combined with various other elements like zinc, magnesium, silicon and many more elements which are listed in chemical composition of Table 1. The melting point of Al2618 is 660˚C and the density of is 2.80 g/cm3.

Table 1- Chemical Composition of Al2024 alloy by Weight%

Zn	Mg	Si	Fe	Cu	Ni	Mn	Cr	Al
0.1	1.8	0.2	1.3	2.7	0.9	0.3	0.1	Balance

The main benefit of integrating the ceramic reinforcement material to the matrix material is to enhance different tribological and mechanical properties. In the current research nano B4C ceramic particulates have been used which is having a density of

2.52 g/cm3 which is lesser than that of Al2618 alloy [8]. Due to this reason the nano reinforcement material is added in steps of two stages during the preparation of the composites to have proper bonding between with matrix and reinforcement and to avoid agglomeration difficulty. The B4Cparticles also have high hardness, good dimensional, phase stability which makes the nano composite materials

to improve fracture toughness, creep resistance and fatigue resistance

Preparation of Composites

Among various fabrication processes, mechanical stir casting processes method was used in the current research work for the preparation nano composite by using Al2618 alloy along with 6 wt. % of 63µm B4C particulates. The crucible which is made from graphite is made to place in an electrical furnace by introducing the pre-weighed Al2618 billet which was made into small pieces. The Electric furnace is heated to the temperature of 750˚C. The B4C ceramic particulates are introduced in small graphite crucible and were preheated to maximum temperature of 400˚C. The digital temperature controller was used to check the temperature of the aluminum molten melt inside the graphite crucible which was placed in an electrical resistance furnace. The degassing agent known as Solid Hexachloro-ethane (C2Cl6) was added to remove the unwanted gases present in the molten melt [9]. Furthermore, to increase the wettability between micro reinforced particulate to the metal matrix a 5 to 10 grams of magnesium was added. By using zirconium coated stirrer, the mechanical stirring was done for the molten metal to the speed of 300-350 rpm for about 5-6 minutes before adding the reinforced particles to achieve a vortex. Once the formation of vortex is achieved then the preheated B4C ceramic particles were added at a constant feed with an equal interval into the molten metal of as cast alloy in two step addition process. The melted molten liquid is poured into a pre heated die made from cast iron and finally allowed to cool at room temperature to obtain the desired samples for further process as shown in fig.1.

Figure 1: Al2618-B4C composites after casting

Testing of Samples

The prepared samples obtained from casting are cut in to an appropriate size of

5 mm thickness and 15 mm diameter, and then subjected to mirror polishing at different levels for microstructure study. Initially, with 1000grit size emery paper the cut samples were polished and then succeed by polishing with Al2O3 suspension on a polishing disc by using soft cloth which is made from velvet. Further the diamond paste of 0.3 microns was used for polishing. Finally, the Keller's reagent chemical was used for etching of the polished surface and at lastly subjected to microstructure study by using the scanning electron microscope (SEM).

The hardness test is done on the polished surface of the specimens by using Brinell hardness for both reinforced of unreinforced materials. The hardness test machine as used for conducting hardness test as a ball indenter of 5 mm diameter and 250kg load for a dwell period of 30 seconds and 5 different set of readings were taken at different locations on the polished surface of the specimen and the average was considered. As per the ASTM E8 [10] the tensile study was carried out on the cut specimens with the use of electronic universal testing machine at room a temperature to study different tensile properties like percentage of elongation, yield strength, and ultimate tensile strength. Fig.2 shows the size of tensile specimen as per ASTM standards used for testing
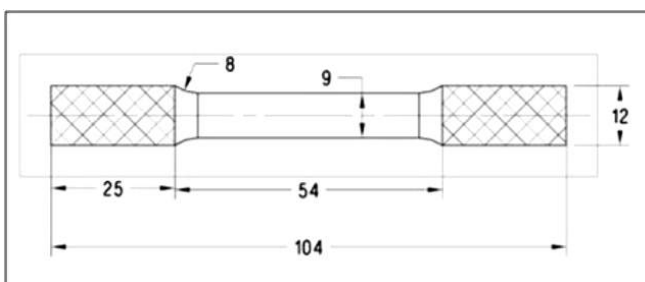
Figure 2: Dimensions of tensile test specimen in mm

The pin on disc machine (DUCOM, TR-20LE) was used to conduct wear test for the study of wear behavior. The dry sliding wear tests were performed on both reinforced and unreinforced materials by having a diameter of 8mm and height of 30mm as per ASTM G99 standards. The wear machine counter disc was made of EN32 steel material. Before the start of the testing process, the acetone liquid is used for cleaning of the disc and test pin surface. The various investigations were led at 3000m sliding distance and 400rpm steady sliding velocity through varying loads of 10N, 20N, 30N and 40N. Similarly, tests were conducted at 40N constant load through varying speeds of 100, 200, 300 and 400rpm. Among testing's, the test pin was kept opposite and stationary to the spherical steel disc while the circular plate was pivoted. The fundamental weight of the test pins samples was measured by using Digital Electronic machine by measuring the accuracy of 0.0001 g. After each test, the acetone liquid was used for cleaning of the worned surface. To measure the wear misfortune the test pin was weighed prior and then after the surface is worned. The measured weight reduction was further changed and calculated into volumetric wear misfortune. Fig.3 demonstrates the wear specimens utilized for the wear investigation.

Figure 3: Wear test specimen

III. RESULTS AND DISCUSSION

Microstructural Study

(a)   (b)
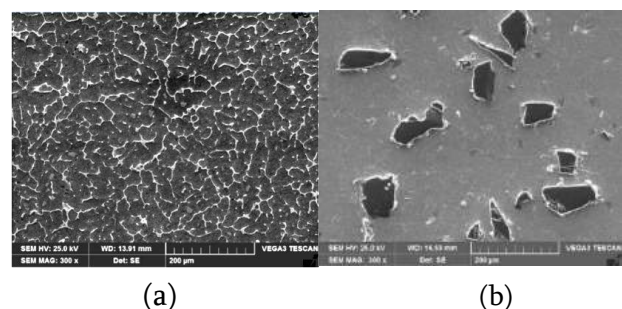
Figure 4: Showing the SEM microstructure photographs of (a) As cast Al2618 alloy & (b) Al2618-6 wt. % B4Ccomposite

To examine SEM images, the samples were preferred from the middle segment from the cylindrical specimens. Fig.4a and b shows the SEM microstructures of as cast Al2618 alloy and the composite of 6 wt. % of micro B4C reinforced with Al2618 alloy. The microstructure of as cast Al2618 alloy comprises of fine grains of solid solution of the aluminium along with an ample distribution of inter-metallic precipitates. In additionally, the prepared micro composite shows the great bonding among the framework and the reinforcement alongside the uniform homogenous circulation of micro estimated B4C particulates without any agglomeration and bunching in the composites. This is essentially because of the practical mixing activity accomplished all through by two stage addition process of B4C. By the uniform distribution of particle in matrix, the grain limit of the lattice obstructs the grain improvement and opposes the separation development of grains amid stacking.
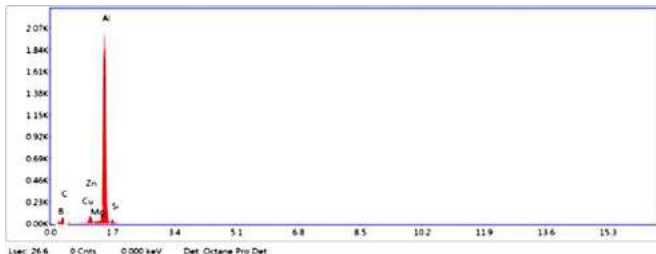
Figure 5: Showing energy dispersive spectrum analysis of Al2618-6 wt. % of 63μm B4C composite

Energy dispersive spectrum analysis (fig.5) confirmed the existence of nano B4C particulates in the form of B (Boron) and C (Carbon) elements in the Al2618 alloy base matrix.
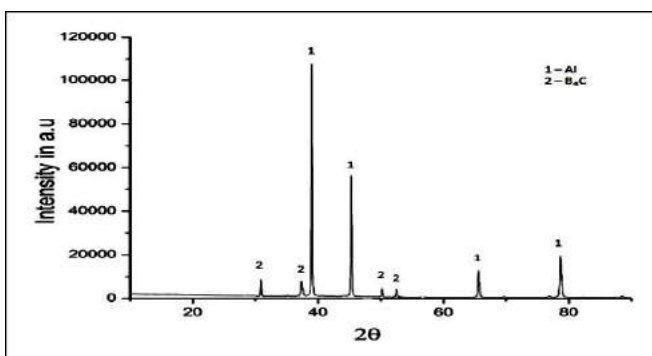
Figure 6: Showing XRD analysis of Al2618-6wt. % of 63μm B4C composite Fig.6, shows the XRD (X-ray diffraction) pattern of the Al2618-6 wt. % micro B4C and the occurrence of Al and nano B4C phase are evidently seen. It can be observed that peak height increases and then decreases on 2-theta scale indicating the presence of different phases of material. In fig. 6it is visible that X-ray intensities of peak are higher at 38˚, 45˚, 65˚& 78˚indicating the presence of aluminium phase. Similarly, it is observed the peaks for different phases of boron carbide at 31˚, 37˚, 50˚ and 54˚.

Hardness
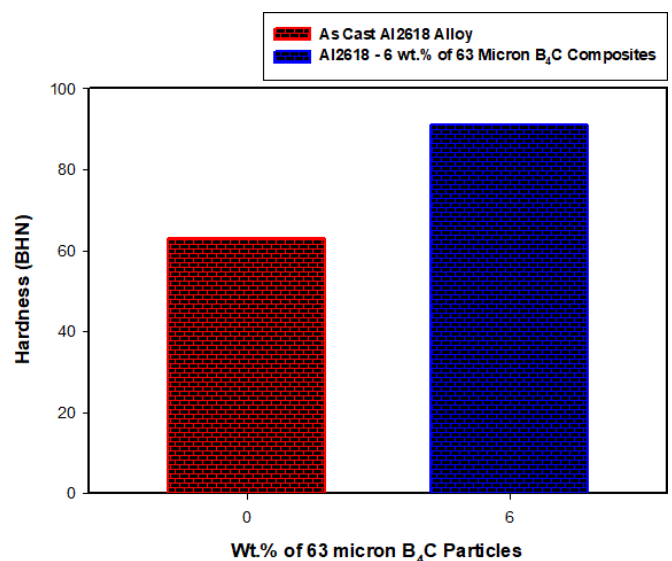
Figure 7: Hardness of Al2618 alloy and 63 μm B4C composites

The hardness is a mechanical parameter demonstrating the capability of resisting of prepared materials to indentation under a static load. The addition of 6 wt.

% of 63μm B4C particulates to the Al2618 alloy with respect to unreinforced alloy can lead to the variation in the hardness which can be observed from figure 7. There is a noticeable increase from 62.9 BHN to 91.1 BHN for aluminum composites. This can be credited to the because of the of harder micro B4C ceramic particles in the lattice than base alloy, and the higher constraint to the localized matrix deformation during indentation as an outcome of the presence of harder phase. Furthermore, the B4C, as other fortifications fortify the matrix by making of higher density dislocations

amid cooling to room temperature because of the distinction of co-efficient of thermal expansion developments between the B4C and grid Al2618 compound. The variance in the strain is developed between the reinforcement and the matrix alloy obstructs the movement of dislocations, by resulting in the enhancement of the hardness of the prepared composites [11, 12].

Ultimate Tensile Strength and Yield Strength
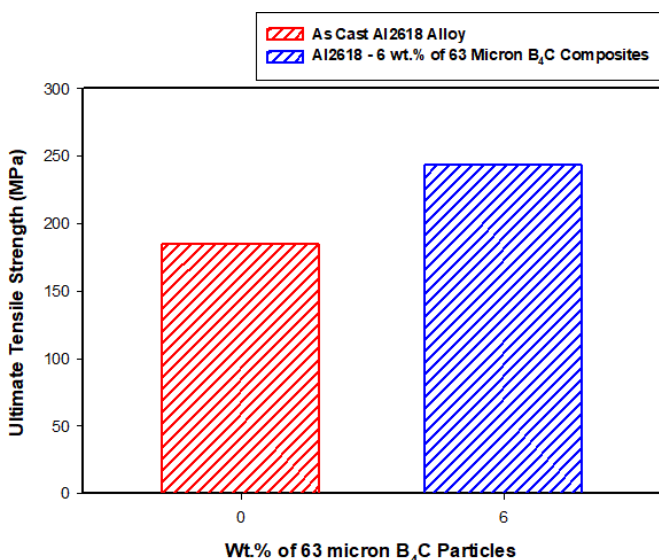
Figure 8: Ultimate tensile strength of Al2618 alloy and 63μm B4C composites Figure 8 represents the plot of ultimate tensile strength (UTS) with 6 wt. % of 63

micron B4C dispersoids in metal lattice composite. As a component of weight rate of B4C particles the calculated estimations of ultimate tensile strength were plotted. When compared to base Al2618 alloy with 6 wt.% of B4Ccomposites, there has been an increase of 31.4% in UTS. Because of legal contact between the framework mixture and the supporting materials there is a major increase in strength. Better the grains estimate better is the hardness and additionally the better quality of composites prompting to enhance the wear resistance [13]. The improvement in UTS is credited by the hard ceramic B4C particulates, which confers value to the framework mixture, in this way by giving improved solid rigidity. The expansion of these hard-micro particles may

have offered rise to huge lasting compressive unease created along with cementing because of contrast in coefficient of developed between flexible matrix and brittle particles. The improvements of quality are likewise attributed to closely packing of the reinforcement and thus little inter particulates spacing in the lattice.
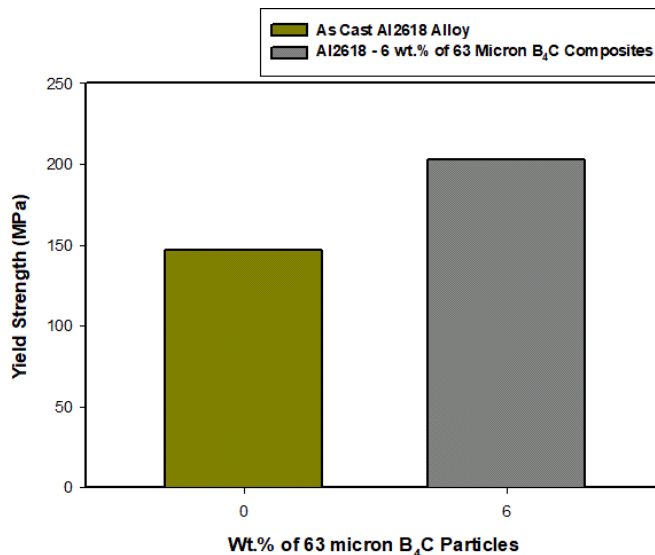
Figure 9: Yield strength of Al2618 alloy and 63μm B4C composites

By noticing that the character of the prepared composites it is extremely dependent on the volume or weight division of the reinforcement leads to the increase in yield quality. Figure 9 showing the variation in yield strength (YS) of Al2618 alloy matrix with 6 wt. % of micro B4C particulates reinforced composites. It is noticed that by adding 6 wt. % of 63 micron B4C particles the yield strength is improved from 147.2 MPa to 202.9 MPa. The expansion in Yield strength of the nano composite is clearly because of the hard B4C ceramic particles which contribute to the quality by delectating the Al alloy network and bringing more quality resistance of the composite against the connected ductility load. On account of micro particle strengthened composites, the uniformly distributed hard ceramic particles in the grid make limitation till the plastic stream, in this way giving upgraded quality to the composite [14].

Percentage Elongation
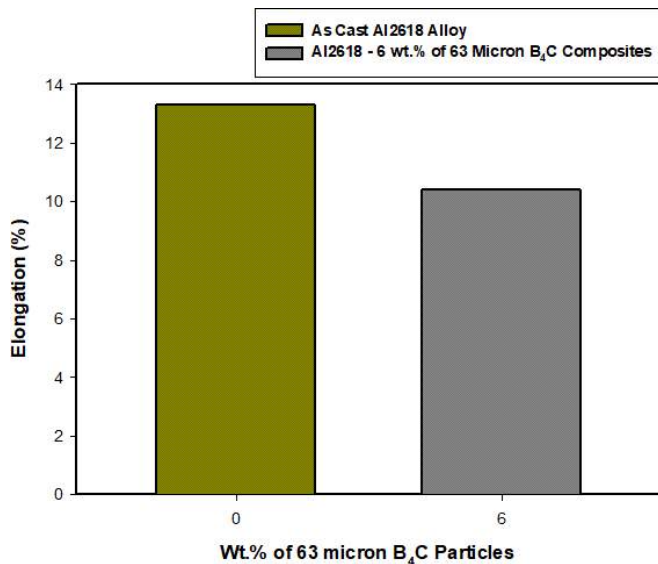
Figure 10: Percentage elongation of Al2618 alloy and 63μm B4C composites Figure 10 representing the impact of micro B4C content on the elongation (ductility) of the composites and the flexibility of the composites reduces essentially with the 6 wt. % B4C prepared composites which can be noticed from the chart. This diminishing in rate prolongation in association with the matrix and reinforcement is a most frequently occurring disadvantage in particulate prepared MMCs. The decreased malleability in nano composites can be assigned to the closeness of B4C ceramic particulates which may get broken to small dendrites by stirring process by having a sharp corner that make the prepared composites distorted to limited part initiate and increase [15]. The delicate collision that happens because of the contact of the hard B4C ceramic particles bringing on expanded locality stretch focus locales may like manner be the reason.

Fracture Studies

(a) (b)
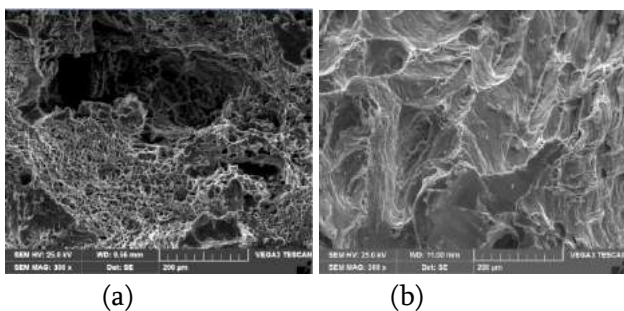
Figure 11: Sample of Fracture surfaces of the tensile test (a) Al2618 matrix alloy (b) Al2618-6wt. % B4C composite

After tensile testing the fracture surfaces (fig.11a-b) of as cast alloy and micro composite samples were characterized by using SEM images to study the mechanism of the fracture. The as cast Al2618 alloy fracture manner is a ductile fracture manner which can be seen in fig.11-a and has huge number of hollow shaped structures and grains are visible. Fig.11b shows that structures have less ductile failure because of reinforcing the 6 wt. % of B4C. The reason for failure of composites during tensile test is because that micro particles cracking all along with matrix material get fracture, and de- bonding between the boron carbide particulates and Al matrix alloy interface. Small voids are observed in the case of 6 wt. % B4C composites, fractured surfaces showed limited stresses at the interfaces is more and small cracks at reinforcement particles mechanism is observed.

Wear Behavior

The varying load at 400rpm along x axis for Al2618 alloy and micro B4C composites wear loss along y axis is represented in the figure 12. Since the load is increased from 10N to 40N the wear loss is also increased but it is lesser in the case of 63μm B4C ceramic reinforced composite
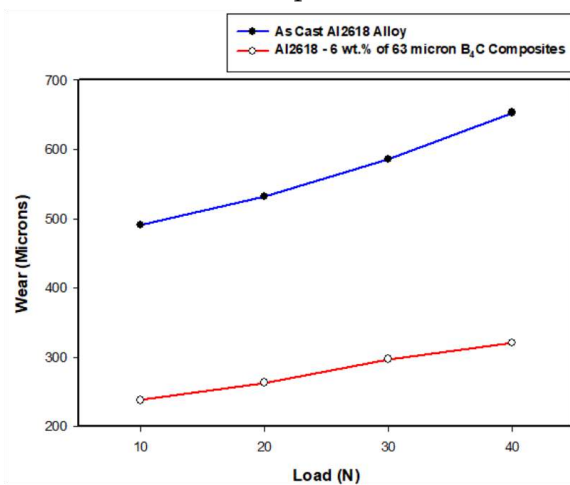
Figure 12: Wear loss of Al2618 alloy and 63μm B4C composites at varying loads and 400rpm constant speed

More wear loss is observed for matrix alloy and for the composites at higher loads varying from 10N to 40N. At maximum loads the pin exceeds the critical value at the temperature of sliding surface. As eventually the load increases on the pin there is also an increase in the wear loss of both the unreinforced alloy and reinforced composite. But it is practically observed that the wear loss of the composites reduces with 6 wt. % B4C ceramic reinforcements in the matrix alloy. This enhancement in the wear resistance of the micro composites is with wt. % of reinforcement is mainly due to the high hardness of B4C particulates which acts as like a barrier for the material loss [16].

The dependence of all the wear loss of Al2618 matrix alloy along with B4C composites on sliding speed is shown in Fig. 13. As the sliding speed (rpm) is increased from 100 rpm to 400 rpm, the losses are also increased for both Al2618 aluminium matrix alloy and its constituent composites due to wear. But although at every sliding speeds, the wear loss of the composites is much lesser, when compared with the matrix alloy.
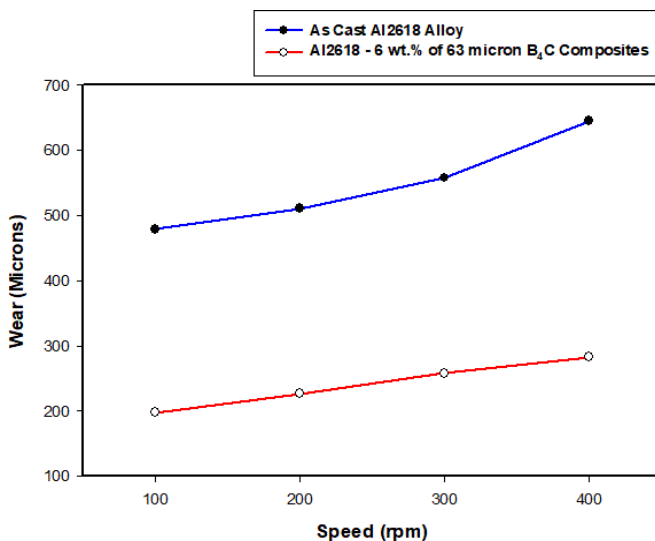
Figure 13: Wear loss of Al2618 alloy and micro B4C composites at different speeds and at constant load (40N)

Additionally, as sliding speed is kept on increasing there is noticeable increase in wear loss also because of softening of the micro composite at increased temperature due to rubbing action. The increase in temperature resulting due to higher sliding speeds also leads to plastic deformation of the test piece. Therefore, there is increased delamination contributing to enhanced wear loss.

Worn Morphology

The Worn surface microphotographs studies of as cast Al2618 alloy and micro B4C reinforced composites are examined by using SEM. Figure 14 characterize the worn surfaces of matrix material Al2618alloy (fig. 14a) and the micro composite surface which is tested at 40N load and 400rpm sliding speed by reinforcing of 6 wt. % of 63 micron B4C (fig. 14b) particles in base materials From fig. 14a it shows in the sliding direction the particular edges and depressions running parallel to each other. It can be seen from the micrograph the cracks are deeper and wider spreading lattice combination Al2618 when compared with micro composites under similar conditions. Because of the sliding of oxide molecule in the reinforced composite it might be seen from figure14b that a break likewise on the well-used outer surface of the Al2618-6 wt. % B4C composite. On account of micro composites, a thick layer could be seen, which shields the basic matrix from being in contact with the sliding partner and along these lines minimizing the volumetric wear misfortune. Therefore, the layer framed on the nano composites gives a self-protective cover to the hidden material as a result repressing the metal-metal contact.

(a)   (b)
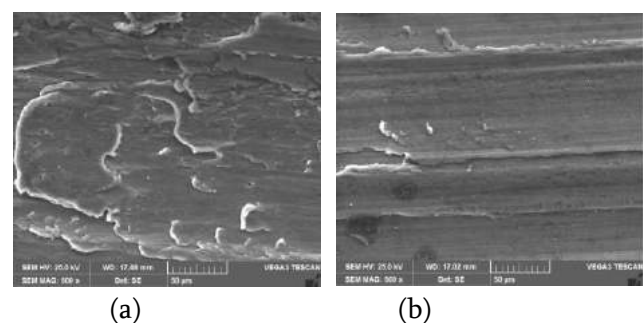
Figure 14: Shows the SEM microphotographs of worn surfaces of (a) as cast Al2618 alloy (b) Al2618-6 wt.%B4C composites at 40N load and 400rpm speed

Applications

Aluminium alloys like Al2024, 2014, 2219 and 7075 are most widely used materials for the aerospace applications. Especially, in the manufacture of aircraft components like wing root fittings, hinges, bulkheads and the frames Al 2XXX and 7XXX series are using, due to their high strength properties. In the aircraft design and manufacturing weight of the component plays vital role as weight of the aircraft is directly affecting fuel consumption. Since, Al2618-B4C micro composites exhibits superior properties, these composites can be used for the fabrication of wing root fitting and hinge design. The major advantage of using these composites is weight saving due to reduced cross sectional area of the components.

IV. CONCLUSION

In this research, by using stir casting fabrication technique the nano B4C/Al2618 micro composites have been fabricated by considering 6 wt. % of reinforcement. The microstructures, mechanical properties like hardness, yield strength, ultimate tensile strength, percentage elongation, and fractography and wear behavior of the prepared samples are studied as per ASTM standards. The matrix is almost free from pores in as cast alloy and uniformly distributed of micro particles in the prepared composite, which is explained from the SEM microphotographs. The XRD and EDS analysis confirms the existence of B4C ceramic particles in the Al2618 alloy matrix. Compared to unreinforced material the various mechanical properties of Al2618-6 wt. % micro B4C composite are superior and enhanced. Due to strain localization, the fracture surface of the composite material consists of small voids. These small voids were then coalesced during the tensile loading, ensuring in the structure of a dimple appearance at the cracked area of surface. The wear resistance of Al2618-6 wt. % B4C composite is significantly superior to that of the unreinforced material. Further, the wear loss of Al2618 alloy matrix and 63 micron B4C particle reinforced composites increased with the increase in load and speed.

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Preparation and Characterization of Heat Treated Nickel Silver for Marine Applications

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ABSTRACT

Copper is one of the first metal ever extracted and used by humans. As a result, copper was important to early humans and continues to be a material of choice for a variety of domestic, industrial, and high technology applications even today. Copper–nickel-Zinc (Nickel silver) is one of the alloys of copper. Nickel silvers are widely used materials for utility in marine and chemical environments for ship and boat hulls, desalination plants, Heat exchangers, seawater and hydraulic pipelines, oil rigs and platforms, fish farming cages, seawater consumption displays etc. because of their superior corrosion resistance, higher electric conductivity, heat conductivity and mechanical properties. A variety of nickel silvers of different compositions have found in commercial use, with most ranging from 20% to 30% of copper and 5% to 10% of zinc by weight, the remaining mass being copper. However, the varying percentages of Copper, Nickel, Zinc and other alloying elements may lead to a large difference in microstructure and performance of Nickel silver. Heat treatment of these alloys is always a challenge to make the material to suit for a particular application. Moreover, there is always a scope for study of processes which enhances the properties of material. In the present investigation specimens of nickel silver were prepared with 30%Ni & 5% Zn and 25Ni & 5% Zn. The prepared specimens were subjected to solutionizing followed by aging heat treatment at 350℃ & 450℃ for 1 hr. and hardening followed by tempering heat treatment at 500℃ & 600℃ for 1hr. respectively for first and second compositions. Different experiments were conducted and concluded with the findings of study and provided with suitable recommendations for future studies.

Keywords : Nickel Silver, Corrosion, Heat Treatment, Microstructure

I. INTRODUCTION

Nickel Silvers also called nickel brasses are alloys containing copper, nickel, and zinc. Though they do not contain silver, they have an attractive silver luster, moderately high strength and good corrosion resistance. They are used to make food and beverage handling equipment, decorative hardware, and electroplated tableware, optical and photographic equipment and musical instruments. Focused research investigations carried out by scientists, researchers and technologists, since last few decades have provided a wealth of new scientific knowledge about the heat treatment techniques, its advantages and applications on different metals / alloys. From the study of recent investigations, it is observed that very little work has been done on heat treatment on alloys, in particular copper alloys. In this regard an

attempt is made to study of effect of heat treatment parameters on properties of Cu30Ni5Zn and Cu25Ni5Zn by using Solutionizing followed by ageing heat treatment and hardening heat treatment followed by tempering process. Microstructural changes are also outlined in this paper.

In the present investigation, the effects of heat treatment on properties such as tensile strength, compression strength, hardness, and microstructure variations on nickel silver have been studied. The results of heat treated specimens from various tests were compared with the base metal.

II. EXPERIMENTAL DETAILS

Preparation

30cm long and 2cm in diameter nickel silver rods of composition as given in Table 1 were prepared via sand casting by dissolving a measured amount of the nickel and zinc pieces in a measured molten copper in a fired pit furnace, Stirred and cast. Fig 1 shows the casted rods of chosen compositions.

The casted nickel silver is machined for the desired size and shape according to the ASTM standards to conduct mechanical tests like tensile, compression and hardness.

Table 1 Chemical composition of nickel silver developed.

Composition #	Copper	Nickel	Zinc
1	65%	30%	5%
2	70%	25%	5%

(a)   (b)

Fig 1: Cast rod of composition #1 (a) and composition #2

Heat Treatment

Heat treatment process is carried out as below: **Specimens of composition # 1** are heat treated by solutionizing followed by ageing at the temperature of 350°C & 450°C for 1 hr.

Specimens of composition # 2 are heat treated by hardening followed by tempering at the temperature of 500°C & 600°C for 1 hr.

Tensile, Compression, Hardness and Microstructure Tests

The machined and heat treated specimens were subjected to tensile and compression tests which was conducted in a Universal Testing Machine (UTM). The specimen dimensions used for tensile and compression tests are as shown in Fig 2.

(a)   (b)
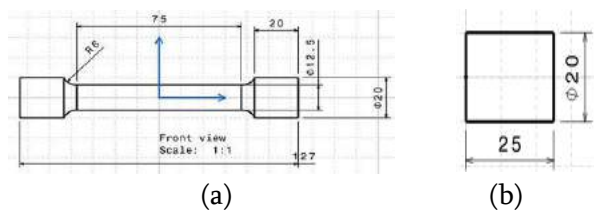
Fig 2: Sketch of Standard Tensile (a) and compression (b)Specimen

Fig 3: Specimens for tensile test

Fig 4: Specimens for compression test

The heat treated nickel silver specimens were subjected to hardness test. Hardness is a characteristic of material and is defined as the resistance to indentation by the materials and it can be measured by permanent depth of the indentation. Brinell hardness test is used with 5mm ball at 250 kg load.

Fig 4: Specimens for hardness

Microstructure test was conducted in metallurgical optical Microscope. Microstructure consists of alpha solid state. The sample is roughened with belt polish and fine polished with various emery papers from 80, 120, 400, 600 grades.

III. EXPERIMENTAL RESULTS

Tensile strength of specimen heated at 500□C was found to be greater than the tensile strength of specimens heat treated at different temperatures. With further increase in temperature of the material to 600□C, the tensile strength of specimen was found to be decreased with compare to other temperatures. Hence, the ideal heat treatment temperature for nickel silver was found to be 500□C in order to enhance its mechanical properties.

Tensile test				
Parameter	350°C	450°C	500°C	600°C
Yield stress, MPa	209.3	233.6	245.1	205.3
Ultimate load	16.77	18.54	20.44	16.11
Tensile strength, MPa	255.3	281.7	298.6	253.5
% Elongation	10.37	9.93	10.78	6.80
Compression test				
Compression load, kN	85.09	90.39	98.15	89.11
Compression strength, MPa	752.3	799.2	798.74	758.66
Hardness test				
Ball dia, mm	5	5	5	5
Applied load. kg	250	250	250	250
BHN	84.83	98.53	102.33	93.6

It was observed the compression strength and hardness of specimen heat treated at 500°C is comparatively greater than other specimens.
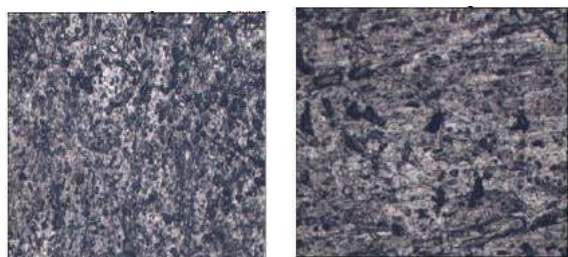
Fig 4: Microstructure of specimens treated at 350°C and 450°C
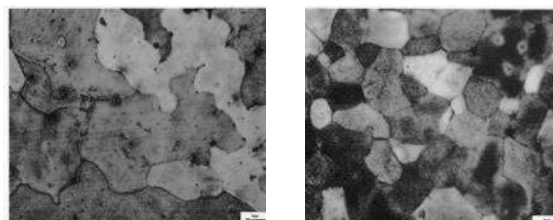
Fig 4: Microstructure of specimens treated at 500°C and 600°C

IV. CONCLUSION

After understanding the literature and conducting some of the mechanical tests on heat treated specimens, we made the following conclusions from the present work.

- Tensile strength of material treated at 500□C is comparatively greater than other specimens.
- Compression strength of specimen heat treated at 500°C is slightly comparable with other specimens.
- Increase in hardness of material is observed up to 500□C and further decreases at 600□C. It is observed that 500°c is ideal temperature for heat treatment of nickel silver.
- Due to increase in temperature to a certain extent i.e. up to 500°C the atoms start vibrating and the homogeneity between alloying elements is achieved. Bonding between the atoms of different elements become strong. But due to further increase in temperature i.e. at 600□C, mean distance between the atoms increases and the bond strength decreases. Atoms cannot maintain their mean positions which cause reduction in tensile strength and hardness.

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Study of Hardness and Wear Properties of Graphene Based Polyester Resin Composites

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ABSTRACT

Graphene is a material comprising a single layer of carbon atoms and having remarkable set of properties that offer potential benefits when added to polymer materials. The overall aim of the investigation to study the behavior of graphene reinforcement which can be used in various composite applications, to improve the properties of neat polyester based matrix materials. The key challenges with the good dispersion of graphene material, and the development of new fabrication processes to synthesis polymer nanocomposites. Graphene based polymer nanocomposites are promising advanced material used for very high performance materials that offer improved mechanical properties, electrical properties and other properties. Herein, an approach is presented to improve the mechanical properties of neat polyester resin by using graphene filler material. Polymer nanocomposites are constructed by uniformly dispersing a nanomaterial into the polymer matrix. Mechanical properties such as hardness and wear properties of graphene reinforced polyester composite were studied. The results showed that the nanofiller reinforced polyester composite tend to exhibit enhancement in mechanical properties as compared to the neat polyester.

Keywords : Nanofiller, Graphene, Polyester, Composites.

I. INTRODUCTION

Nanocomposites material has significantly to encompass a large variety one-dimensional, two-dimensional, three-dimensional and amorphous materials, made of distinctly dissimilar components and mixed at the nanometer scale. The general class of nanocomposites are organic/inorganic materials is a fast growing area of research. The properties of nano-composite materials depend not only on the properties of their individual parents but also on their morphology and interfacial characteristics. In the present age, the main focus area is in identifying a nanocomposites material which is lighter in weight, eco-friendly, bio-degradable, cost-effective, performance-oriented as well as suited for diverse applications. Unsaturated polyester resin is used for a wide variety of industrial and consumer applications [1]. This consumption can be split into two major categories of applications: reinforced and without reinforced. In reinforced applications, resin and reinforcement, such as fiberglass, are used together to produce a composite with improved physical properties.

The discovery of graphene used as a nanofiller for the production of lightweight, low cost, and high-performance composite materials for various

applications. Advanced composites are composite materials that are traditionally used in the aerospace components, parts of racing cars, transport vehicles applications. Choice of fabrication method depends on matrix properties and the effect of matrix on properties of reinforcements [2]. The incorporation of nanoparticles into polymers exhibit behavior different from conventional composite materials with microscale structure, due to the small size of the structural unit and the high surface to volume ratio [3]. From the literature studies gaps has been identified to manufacture graphene based polyester composites. The aim of the present investigation was to study the graphene reinforced and unreinforced composites fabricated using solution casting method. The dispersion of graphene in polyester matrix will be analyzed to study the mechanical properties.

II. Experimental Method

Materials
Graphene (GR)

The Graphene (GR) used as reinforcement in this study was supplied by United Nanotech Pvt Ltd Hoskote, Bangalore. Normally, Chemical vapour deposition was used to produce the GR with high aspect ratio, high purity of 96- 99% and surface area of 323- 600 m2/g.

Matrix

Unsaturated Polyester with 2% cobalt naphthanate as accelerator, 2% Methyl Ethyl Ketone Peroxide (MEKP) as catalyst in 10% Di-Methyl Aniline (DMA) solution as promoter, in the ratio of the resin/accelerator/catalyst/promoter.

Preparation of graphene based polymer composites In fabrication of nanocomposites the graphene of 0.25wt%, 0.5wt%, 0.75wt% and 1.0wt% was added to epoxy material using solution casting method. The Fig1 shows the steps involved in preparation of polymer nanocomposites
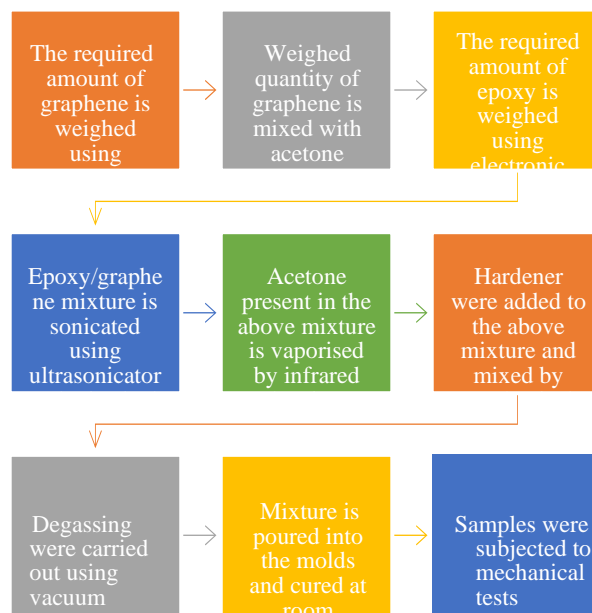
Fig 1 Steps in polymer nanocomposites synthesis

Hardness test

Hardness testing samples were prepared as per ASTM D 785 standards. In each case, five samples were tested and the average value was tabulated. Hardness test were carried out using Rockwell hardness testing machine.

Wear test

Wear testing samples were prepared as per ASTM G99 standards. In addition of graphene wt%, five samples were tested and the average value was tabulated. The wear testing were carried out using pin-on-disc wear testing machine.

III. RESULTS AND DISCUSSION

Hardness properties

Fig 2 shows the effect nanocomposites with addition of 0.25 wt%, 0.5wt%, 0.75wt% and 1.0wt% of graphene with polyester resin. Hardness measurements were carried out at 3 different locations and average value of the hardness was considered. The results of hardness test showed in Fig 2, the addition of graphene with polyester indicates improved hardness strength and decreased strength without addition of graphene filler. The hardness of the pure polyester specimen is low when compared addition of nanofiller, this is due to the

high surface area of graphene causes to enhance the hardness properties of nanocomposites.
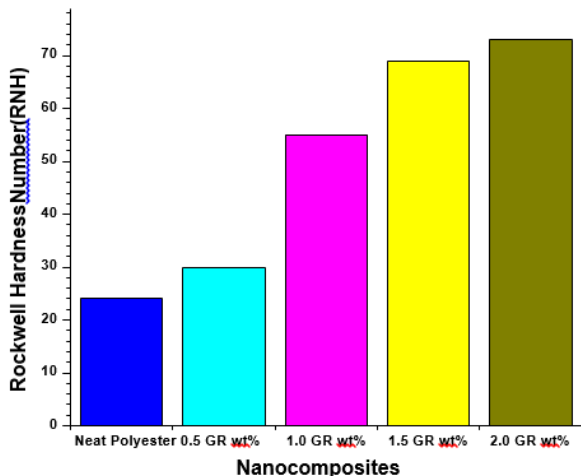
Fig 2 Hardness of polymer nanocomposites at different wt % of graphene content

Wear properties

Fig 3 shows the wear rate of nanocomposites with addition of 0.25 wt%, 0.5wt%, 0.75wt% and 1.0wt% of graphene with polyester resin. The wear test was conducted using pin on disc wear testing machine, neat polyester along with the graphene reinforced polyester samples were tested at constant speed and varying load.

The results indicated that for pure polyester the wear rate is high as compared to the graphene reinforced specimens. The wear rate decreased with increased in wt% of graphene, this is because of good interaction between matrix and reinforcement material and less agglomeration effect in the nanocomposites.
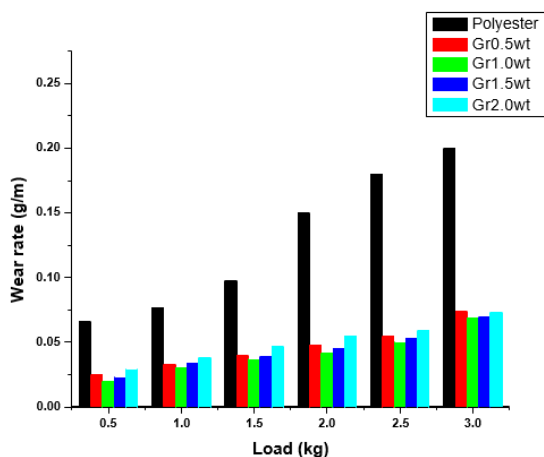
Fig 3 Wear rate of polymer nanocomposites at different wt% of graphene content

IV. CONCLUSION

Nanocomposites has excellent mechanical properties such as hardness and wear rate. The addition wt% of graphene as reinforcement in the polyester matrix doubled the hardness strength compared to neat polyester matrix. The wear rate decreased with increased in wt % of the graphene reinforcement in the polyester. The higher mechanical properties observed at 1wt% addition of graphene nanofiller due to high surface area.

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Analysis on Safety Bumper Placed at the End of Race-Track using MATLAB

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ABSTRACT

A bumper (American English) or shield (British English) is a structure attached to or integrated with the front and rear ends of a motor vehicle, to absorb impact in a minor collision, ideally minimizing repair costs. In racing the bumpers are also used at the end of the race track to stop the out of control vehicles at that instant of time and position with minimum injury. The present work is the analysis on typical safety bumper placed at the end of race-track to stop out of control vehicles. The vehicle of mass 1800kg hits the bumper at a velocity of 90 km/h. Analysis is carried out using MATLAB software. The result shows the curve variation between velocity of car and displacement of bumper. It was found that the velocity of car decreases with increase in displacement of bumper. This analysis helps in preliminary stages of designing the bumpers.

Keywords : bumper, race-track, MATLAB, displacement, velocity

I. INTRODUCTION

Automotive design with economy and safety has been a great challenge. Automotive frontal bumper beam plays an important role in absorbing impact force. Bumper absorbs 15% of total energy in New Car Assessment Programme (NCAP) crash test.

Bumper is a part of an automotive designed that had at a vehicle. Bumper comprised an elongated support which can be attached to the front and rear of the vehicle body and which spans the width of the vehicle body, a shock absorber extending along the support part and extending towards the front and rear of the vehicle body in a substantially convex manner, and an elastic exterior shell which can be connected to the support part and which encompasses the front and rear of the vehicle in an approximate U shape, covering the side of the support part opposite the side facing the front and rear of the vehicle body where in the support part has a middle section that can be firmly supported on the vehicle body.

Bumper is divided in two types, they are front bumper and rear bumper. Main function both of them are for absorbing impact by reducing damage and to the potential for bodily injury during an accident.

For this paper, it is focused on the bumper system which is placed at the end of racing track to stop the vehicles which are out of control. MATLAB is used in analyzing the velocity of vehicle and displacement of bumper after vehicle hits the bumper.

MATLAB is powerful computing software which is presently utilized in a number of educational institutions around the country to solve mathematics and engineering-related problems. The name of the software MATLAB stands for "Matrix Laboratory"

since the built-in capabilities of this package are specifically designed for efficient handling of matrix and array operations. The effective and easy to-use computing environment of MATLAB along with availability of a large number of helpful MATLAB built-in functions has rendered it the popular tool of choice for many educators in various engineering fields. Using the MATLAB interactive environment, programs placed in script files can easily be created and edited to perform the desired computations and to generate the needed output. The capabilities of MATLAB can further be enhanced by additional "toolbox" modules that can separately be purchased through The Math Works, Inc., the company that produces the MATLAB software. These modules are designed to perform a variety of specialized tasks. The solutions presented in this paper are obtained using the basic features of MATLAB without utilizing any specialized MATLAB toolboxes.

II. PROBLEM STATEMENT

A safety bumper placed at the end of a race-track to stop out of control vehicles is as shown in Fig. 1.
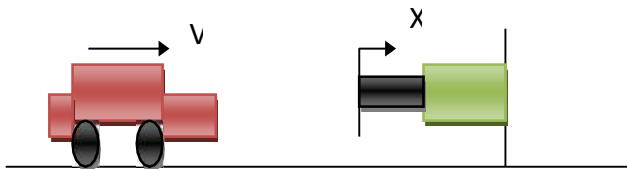
Fig. 1 Safety bumper with displacement' x' and vehicle with velocity 'v'

Let the force that the bumper applies to the vehicle is given by the mathematical relation.

$F = Kv^3(x + 1)^3$

Where, K = 32 kg-s/m5 (a constant)

x = displacement of the front edge of the bumper

v = velocity of the front edge of the bumper

A vehicle of mass 1800 kg hits the bumper at a speed of 90 km/h. writing a MATLAB program to determine and plot the velocity of the vehicle as a function of x for $0 \leqslant x \leqslant 4$m.

III. ANALYTICAL FORMULATION

The formulation for the problem statement as mentioned previously is as below.

The deceleration of the car once it hits the bumper can be calculated from Newton's second law of motion.

$$ma = -Kv^3(x + 1)^3$$

which can be solved for the acceleration a as a function of v and x:

$$a = \frac{-K v^3(x + 1)^3}{m}$$

The velocity as a function of x can be calculated by substituting the acceleration in the equation:

which gives:

$$vdv = adx$$

$$\frac{dv}{dx} = \frac{-K v^3(x + 1)^3}{m}$$

The last equation is a first order ODE that needs to be solved for the interval $0 \leqslant x \leqslant 4$ with the initial condition:

$$v = 90 \text{ km/h at } x = 0.$$

IV. MATLAB SOLUTION

Numerical solution of differential equation is shown in the following program written in a script file (m-file), which should be executed by typing the file name in command prompt in MATLAB.

4.1 MATLAB Program:

```
global k m
k=32; m=1800; v0=90;
xspan=[0:0.2:4]; v0mps=v0*1000/3600;
[x v]=ode45(@bumper,xspan,v0mps) plot(x,v)
xlabel('x (m)'); ylabel('velocity (m/s)')
```

The function file with the differential equation named bumper.m to be saved: function dvdx=bumper(x,v)

```
global k m dvdx=−(k*v^2*(x+1)^3)/m;
```

4.2 MATLAB Result:

Output obtained from the MATLAB is as shown in Table 1, where x is displacement and v is the velocity at front end of the bumper, also typical variation in the curve x vs. v is as shown in Fig. 2. It can be observed the there is decrease in velocity with increase in displacement. Displacement is varied between 0m to 4m with the increment of 0.2m.

Table 1. Ouput x vs. v

x =	v =
0	25.0000
0.2000	22.3356
0.4000	19.0022
0.6000	15.4599
0.8000	12.1627
1.0000	9.3757
1.2000	7.1575
1.4000	5.4705
1.6000	4.1922
1.8000	3.2462
2.0000	2.5317
2.2000	1.9985
2.4000	1.5913
2.6000	1.2814
2.8000	1.0409
3.0000	0.8537
3.2000	0.7059
3.4000	0.5885
3.6000	0.4942
3.8000	0.4180
4.0000	0.3558
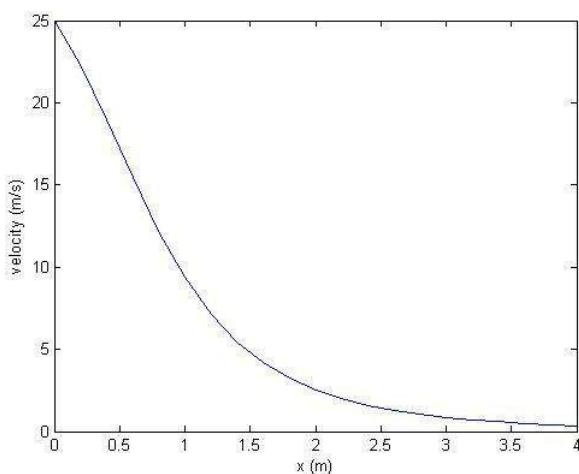
Fig 2. Plot displacement (x) vs. velocity(v)

V. CONCLUSION

The present work is the analysis on typical safety bumper placed at the end of race-track to stop out of control vehicles. The vehicle of mass 1800kg hits the bumper at a velocity of 90 km/h. Analysis is carried out using MATLAB software. The result shows the curve variation between velocity of car and displacement of bumper.

The following conclusions drawn from the analysis are:

1. MATLAB is a simple, powerful and faster computation platform for solving higher order differential equations and plotting 2D and 3D graphics result.

2. Various built-in functions, added features and capabilities in post-processing are available in MATLAB, which makes easy to write program and understand the obtained results.

3. Paper becomes a ready reckoner for engineers in understanding bumper displacements when vehicles hit the bumper.

4. The solution obtained for the analysis which shows MATLAB can give accurate result for higher order complex differential equations and can eliminate theoretical approaches.

5. Result shows that the velocity of vehicle decreases with increase in displacement of bumper.

6. The decisions related to the design of bumpers can be made faster.

The work is no more exhaustive, further analysis with varied displacement and velocity can be brought and highlighted in future scope of paper work.

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Fabrication and Study of The Effect of Flyash On Aluminium 2024 Composite

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ABSTRACT

Al-alloys are widely used application due to their low density, good mechanical properties, better corrosion resistance, wear resistance as compared to conventional metals and alloys. Fly ash is chosen because of it is least expensive and low density reinforcement available in large quantities as solid waste by-product during manufacturing of bricks. Due to low weight it can be utilized in automobile application and thus improving its life. The present work has been done on Al alloy 2024 Fly ash composite. These were fabricated using Al-2024 alloy as metal matrix and fly ash as reinforcing material. Various weight based composites like (Al 100% - FA 0%), (Al 95% - FA 5%), (Al 90% - FA 10%), (Al 85% - FA 15%) were fabricated by Stir casting technique. The obtained composites were sized into small specimens and tests like hardness test, wear test, tensile test, and microstructure test were carried out.

Keywords: Composite, Fly ash, Al - 2024, Wear, Hardness, Tensile, Microstructure

I. INTRODUCTION

A. Aluminium 2024

Aluminium alloy 2024 has a thickness of 2.78 g/cm³ (0.1 lb/in³). Electrical conductivity of 30% IACS. Young's Modulus of 73 GPa (10.6 Msi) over all tempers. 2024 aluminium amalgam's creation generally incorporates 4.3-4.5% copper, 0.5-0.6% manganese, 1.3-1.5% magnesium and not exactly a large portion of a percent of silicon, zinc, nickel, chromium, lead and bismuth. It has an extreme elasticity of 140– 210 MPa (21– 30 ksi), and most extreme yield quality of close to 97 MPa (14,000 psi).

B. Flyash

Fly ash particles are generally spherical in shape and range in size from 0.5 μm to 300 μm. Fly ash is a heterogeneous material. SiO2, Al2O3, Fe2O3 and occasionally CaO are the main chemical components present in fly ashes. Two classes of fly ash are defined by ASTM C618: Class F fly ash and Class C fly ash. Fly ash can be dark gray, depending on its chemical and mineral constituents. Tan and light colors are typically associated with high lime content. Fly ash color is very consistent for each power plant and coal source.

Table.1 Composition of Flyash

Sl. No.	Composition	Percentage
1	SiO2	60.21
2	Al2O3	26.08
3	Fe2O3	4.80
4	CaO	1.00
5	MgO	0.25
6	Total alkali as Na2O	0.86
7	SO3	0.25
8	Cl	0.005
9	LOI(Loss in Ignition)	1.71

Fig.1 Flyash

C. Rockwell Hardness Test

Rockwell hardness of a Specimen involves application of a minor load followed by major load. The minor load resets to zero position. Major load is applied, then removed while maintaining minor load. Depth of penetration from the zero position is measured on a dial, in which a harder surface gives a much higher hardness number. The advantage of Rockwell hardness is that it displays the hardness values directly. Readings to be taken on a flat surface, as convex surfaces gives error readings.

D. Wear Analysis (Pin-On-Disc)

In a pin-on-disc wear tester, a Specimen is loaded on a flat rotating disc in a way that the circular wear path by the machine is followed. The machine is used to evaluate various wear and friction properties for different materials under pure sliding.
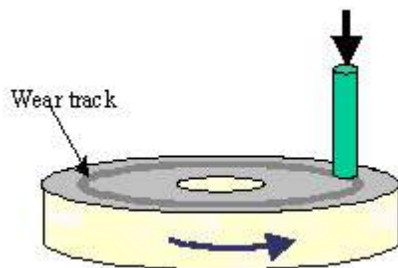
Fig.2 Pin on Disc analysis

E. Tensile Test

This is a fundamental material test in which a sample is subjected to controlled tension until failure, it has maximum elongation and reduction in area. Properties that are directly measured via tensile test are ultimate tensile strength.

Samples were machined and tested as per ASTM E8 standard. Bench tensometer was the device used to test the tensile strength. The electronic Tensometer is a compact and bench model horizontal Tensile Testing Machine of capacity 20 KN. It is a small version of UTM- Universal Testing Machine and is used for testing tension and also compression, shear and flexural properties of different materials.

Table.2 Specimen Composition

Specimen	Aluminium 2024 (wt %)	Flyash (wt %)
Specimen 1	100%	0%
Specimen 2	95%	5%
Specimen 3	90%	10%
Specimen 4	85%	15%

II. EXPERIMENTAL RESULTS AND DISCUSSION

A. Wear Test

Table 3 Wear test results

COMPOSITION	SPEED (RPM)	LOAD (N)	TIME (min)	WEIGHT (gm) INITIAL	FINAL	WT. LOSS	WEAR RATE (gm/mm)
0%	600	9.81	5	3.2638	3.2614	0.0024	$2.4047*10^{-6}$
	500	19.613	5	3.2614	3.2535	0.0079	$9.4940*10^{-6}$
5%	600	9.81	5	2.5267	2.5140	0.0127	$1.2718*10^{-5}$
	500	19.613	5	2.5140	2.5042	0.0098	$1.1777*10^{-5}$
10%	500	19.613	5	2.5829	2.5076	0.0753	$4.2920*10^{-7}$
	500	19.613	5	2.5076	2.5058	0.0018	$8.0969*10^{-5}$
15%	500	19.613	5	3.0202	3.0032	0.0017	$2.060*10^{-6}$
	500	19.613	5	3.0032	2.9859	0.0173	$1.4571*10^{-5}$

B. Tensile Test

Table 4 Tensile Test Results

Sl.no	PARAMETERS	SPECIMEN 1	2	3	4
1	Initial area, (mm²)	32.68	32.68	32.68	32.68
2	Initial gauge length, (mm)	25	25	25	25
3	Peak load, (N)	5555.8	5065.4	5845.8	6119.8
4	Engineering Ultimate Tensile strength, (MPa)	174.2	160.7	185.8	190.8
5	True Ultimate Tensile strength, (MPa)	210.9	182.00	222.8	284.1

C. Hardness Test

Table 5 Hardness Test Results

COMPOSITION (Flyash)	APPLIED LOAD (Kg)	BRINELL HARDNESS NUMBER
0%	100	90.59
5%	100	113.162
10%	100	143.41
15%	100	153.162

D. Microstructure Examination

The microstructure observations of the casted specimens are as shown below. The microstructures show the distribution of Flyash particles. The grain boundaries are visible and no porosity is seen.

SPECIMEN 1

SPECIMEN 2

SPECIMEN 3

SPECIMEN 4
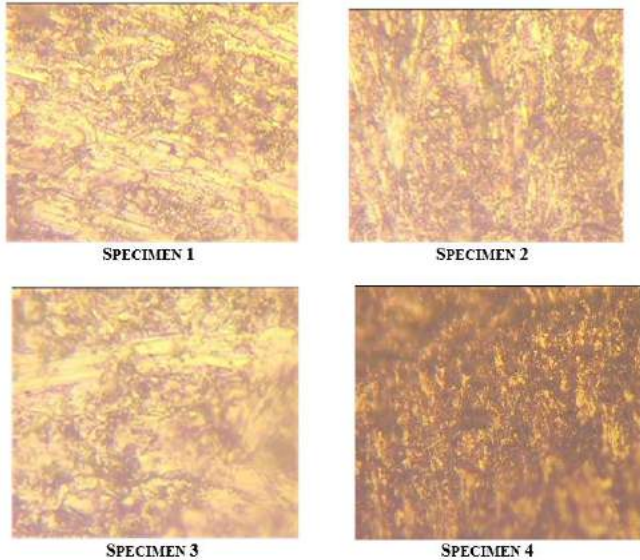
III. CONCLUSION

Al 2024 with flyash composite was synthesized successfully by using stir casting technique. By adding flyash the strength of al 2024 alloy gets improved. This is due to the presence of hardened fly ash particles and oxides. The reinforced Al2024 exhibits higher tensile strength. The hardness values increased compared to the pure alloy without reinforcement and specimen 4 was found to have the highest hardness number. The reinforced composites were found to have less wear loss compared to the base alloy. Microstructure evaluation showed dispersion of the reinforcements in the specimens.

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Studies and Characterization of Electroless Ni-Mo-P Alloy Coating

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ABSTRACT

An endeavor has been made to deposit ternary Ni–Mo–P coatings autocatalytically utilizing nickel sulphate and sodium molybdate as nickel and molybdenum sources, separately, and sodium hypophosphite as a lessening operator. These coatings were deposited utilizing a soluble citrate based shower and were contrasted and plain Ni–P coatings. The two coatings were described for their structure, morphology and hardness. Results obtained from EDX analysis showed that binary Ni–P alloy contains 12.74 wt.% of phosphorus. Incorporation of molybdate had reduced the phosphorus content to about 1.09 wt.% in ternary Ni–Mo–P deposits. Apart from phosphorus and nickel contents, a trace of sulphur were noticed in ternary Ni–Mo–P deposit. Structural examination carried out by XRD studies revealed the presence of a broad peak with a calculated grain size of 2.88 nm for binary Ni-P alloy, where as a sharp peak with a grain size of 27.4 nm is obtained for ternary Ni–Mo–P alloy. Microhardness measurements were made for as-deposited and heat treated coatings. Hardness is increase till 400°C and then decreases as like ternary Ni-Mo-P coatings.

I. Introduction

Materials utilized for designing application are picked by their novel properties. In any case, a large portion of the materials don't have all the necessary properties like hardness, wear, scraped area and consumption obstruction and so forth. Thus, to bestow such explicit properties surface adjustment is completed for the base materials either by altering the surface itself or by including another layer, for example, a covering. Albeit various sorts of covering strategies are accessible like physical vapor affidavit, concoction vapor statement, electro or electroless plating, electroforming and so on., electroless plating has increased extensive consideration because of its special properties like uniform thickness, promptly versatile for three dimensional inclusion and conceivable to plate both conductive and protecting surfaces.

Nickel sulphate baths are widely used for electrodepositionof nickel and Ni–P alloys in acidic baths. Ni–P alloysobtained by electrolytic deposition have been highlighted due toits good physical and chemical properties, such as highcorrosion resistance, good magnetic and thermal properties,etc. [1–3]. Ni–P alloys can also be prepared by autocatalyticprocess and are widely used for the production of uniform, lessporous, adherent deposits for many industrial applications.Generally, these binary

alloys are prepared by autocatalyticmethod using nickel sulphamate or nickel chloride as a nickelsource and hypophosphite as a reducing agent along withcomplexing and buffering agents.

ENP coatings are broadly utilized by virtue of their great useful properties. It has been contemplated out that this magnificent conduct is because of the nearness of phosphorus. Prior investigations uncover that joining of molybdate into the store modifies the useful properties. The impact of sodium molybdate on a nickel compound electroless testimony process and the combination structure has been examined as of late.

By scanning through the available literature not much information is available on the studies carried out on introduce of sodium molybdate in the electroless nickel bath and the characterization of resulting deposits. Hence, the present investigation focuses on the preparation of both binary Ni-P and ternary Ni-Mo-P alloys for comparison. The obtained deposits are characterized for their structure, composition, morphology and hardness.

II. EXPERIMENTAL

The composition of the basic bath used for the preparationof ternary Ni–P and ternary Ni–Mo–P alloys is given in Table1. Nickel sulphate concentrate of 22-30 g/L was used as anickel source in the electroless bath for the deposition ofbinary and ternary alloys. Mild steel specimens (2.5 cm×2.5 cm×0.08cm) were used as substrate for binary and ternary alloydeposition. The composition of the mild steel substrate isgiven below:

C(wt. %)	Mn(wt. %)	Si(wt. %)	Fe(wt. %)
0.13	0.18	0.1	Balance

Specimens were degreased in acetone, cathodically cleanedin 10% sodium hydroxide solution for 5 min at 15 A/dm2,rinsed in running water and deionized water. The degreasedsamples were deoxidized in 50 vol.%sulphuric acid solutionfor 30s, rinsed in running water and deionized water andplaced in the electroless solution for plating. The electroless

Table 1: Composition and operating conditions of the plating baths

Chemical composition	Concentration (g/L)	
	Ni-P	Ni-Mo-P
Nickel Sulphate	22-30	22-30
TriSodium Citrate	20-30	20-30
Ammonium Sulphate	25	25
Sodium Molybdate	-	1
Sodium Hypophosphite	15-25	15-25
Lactic acid	4-6 ml	4-6 ml
Operating Conditions		
pH	8 ± 0.2	11 ± 0.2
Temperature (°C)	80 ± 2	85 ± 2

Table 2: Composition of as-plated electroless nickel alloy coatings determined by EDX analysis

Type of coating	P (W.%)	Mo (W.%)	Ni (W.%)
Ni-P	12.74	---	87.26
Ni-Mo-P	1.03	16.52	82.66

solution was taken in a 250-ml glass beaker which was keptin a constant temperature water bath (Siskin Julabo VPCmodel) to heat the solution to 90 °C. Stirring of theelectroless nickel alloy bath was not employed. Both binaryand ternary deposits were plated for 2 h with a deposition rateof approx.12μm/h. After plating, the samples were againrinsed in running water and deionized water, dried andpreserved for characterization.X-ray diffraction (XRD) measurements of the deposits weremade in as plated condition with a Rigaku

D/max 2200 powderdiffractometer using Cu Kα radiation. Scanning electronmicroscope (SEM-Model Leo 440I) with EDX (EnergyDispersive X-ray analysis, Oxford) attachment was used todetermine the elemental composition of the deposits.
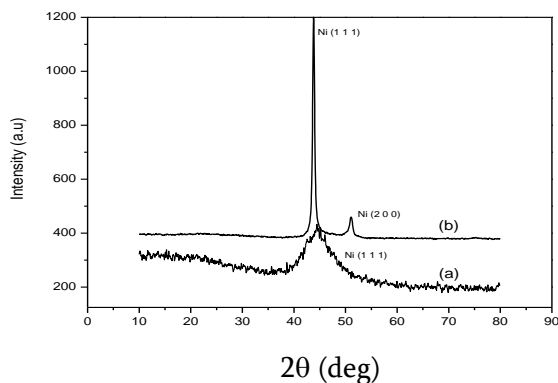
Fig 1. X-ray diffraction patterns of as-plated electroless(a) Ni-P, (b) Ni-Mo-P coatings

III. RESULTS AND DISCUSSION

As-deposited coatings of thickness 23±2 μm on mild steel samples are subjected to energy dispersive analysis of X-ray (EDAX) to find out the Mo and P elements co-deposited in EN matrix and are given in table 2. It is clear that binary Ni-P deposit contains 12.74 wt.% P. Small amount of Mo has been co-deposited due to the addition of 1 g/L of sodium molybdate in the alkaline EN bath without affecting the P content of 25 g/L. It can also be seen from the table 2 that the incorporation of sodium molybdate in the bath, P content decreased from 12.75 to 1.09 wt.%. From this it can be concluded that Mo incorporation has affected the composition of ternary Ni-Mo-P deposits. The decrease in P content withsodium salts of molybdate in EN bath could be due to the increase of metals to hypophosphite ion ratio in the EN bath.

The X-ray diffraction patterns of the as-plated Ni-P and Ni-Mo-P deposits are shown in fig 1. In both diffraction patterns, the reflections corresponding to the (111) plane of a face centered cubic (fcc) phase of nickel could be observed. From Fig 1(a) it can be observed that as-deposited binary Ni-P coating had only a single, broad peak at 44° with a calculated grain size (from Debye Scherrer formula) of 2.8 nm. Co-deposition of molybdate in Ni-P deposit has reduced the peak broadness and increased the peak sharpness fig 1(b). Apart from high intensity peak one more very low intensity peak at 51° is also noticed which can be ascribed to Ni (2 0 0). Grain size of ternary Ni-Mo-P alloy is 27 nm.
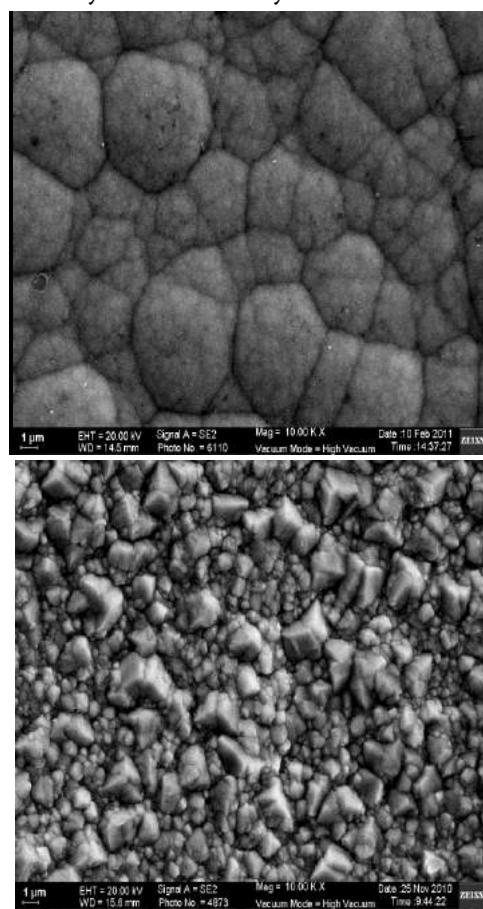
Figure 2. SEM micrographs of as-plated electroless nickel alloys at 1000X (a) Ni–P and (b) Ni–Mo–P.

Chemical resistance of electroless nickel coatings is strongly dependent on the P content of Ni-P deposits which affects the structure [10] whereas the surface morphology is influenced by the chemical constituents present in the electroless nickel bath

[11]. The effect of Mo co-deposition in electroless Ni-P matrix on the morphology of ternary Ni-Mo-P alloys is shown in fig 2. Plain Ni-P deposit exhibits a smooth morphology with fine nodules fig 2 (a).As shown in fig 2 (a) Ni-P deposits exhibited cauliflower type of morphology with smooth nodules. Pores are also visible in this deposit and appear as dark regions. However, these are very small pores and may not be penetrated to the substrate surface. Whereas Ni-Mo-P depositexhibits coarse type of morphology compared to binary Ni-P deposit as shown in fig 2 (b). Similar observations are also noticed for other ternary alloy deposit like Ni-W-P [13]. From the above it can be observed that by incorporation of Mo in Ni-P matrix has affected not only the morphology but also composition of the as-deposited ternary Ni-Mo-P deposits.

Table 3: Microhardness of electro less deposits in as-plated and heat treated at various temperatures for 1 hour.

Temperature (°C)	Ni-P (VHN50$_{gf}$)	Ni-Mo-P (VHN50$_{gf}$)	ΔH%
RT	536	664	23.88
200	621	737	18.67
250	715	814	13.84
300	813	902	10.94
350	914	994	8.75

Microhardness measurements made on the cross-sections of plain Ni-P and ternary Ni-Mo-P deposits in as-deposited and annealed at various temperature conditions for 1 hr. Table 3 shows the hardness values for Ni-P and Ni-Mo-P coatings at different heat treated temperatures. Binary Ni-P deposit exhibited microhardness value of 536 VHN in as-plated condition. The obtained hardness value is considerably high compared to that of bulk nickel (100-150 VHN) and electrodeposited nickel (250-350 VHN). Co-deposition of Mo showed an increase in hardness in all the cases. From the table it is

evident that maximum hardness values are obtained at 350°C. The percentage increase in hardness due to Mo inclusion is also shown in Table 3. Both Mo and P contents influence the as-deposited hardness. It is well known that the co-deposited Mo is in solid solution form [10] and P is in supersaturated form in EN matrix. Since the Ni-Mo-P is having high Mo (16.25 Wt %) and low P (1.09 Wt %) contents and due to the heat treatment small amount of nickel phopshide could have formed.

From the table 3 it is evident that there is about 24% increase in hardness has been obtained for as plated Ni-Mo-P deposits compare to Ni-P deposits. Peak hardness of about 990 VHN has been obtained for the annealed Ni-Mo-P deposits at 350°C/1hr. In general both binary Ni-P and ternary Ni-W-P deposits exhibited the maximum hardness of 920 – 980 VHN after annealing at 400°C/1hr [10]. Whereas in the present investigation the peak hardness obtained at 350°C could be due to the presence of low phosphorus in Ni-Mo-P deposits.

IV. CONCLUSIONS

Electroless Ni-Mo-P Ternary alloy coating has been successfully prepared. Ni-P deposits exhibited cauliflower type of morphology with smooth nodules. Whereas Ni-Mo-P deposits exhibited coarse morphology. From EDAX analysis, it is clear that Ni-P deposit contains 12.75 Wt.% P and 87.25 Wt.% Ni and the Ni-Mo-P deposit consists of 1.09 Wt. % P, 16.25 Wt. % Mo and 82.66 Wt. % Ni. Calculated grain sizes using XRD data indicated that higher grain sizes obtained for the ternary Ni-Mo-P deposits compared to binary Ni-P deposits. Microhardness measurements made on the cross-sections of plain Ni-P and ternary Ni-Mo-P deposits in as deposited and annealed at various temperatures for 1 hr indicated that at all heat treated conditions, Ni-Mo-P deposits showed better hardness than Ni-P coatings.

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Design and Development of Universal Seeding, Weeding and Spraying Equipment

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ABSTRACT

This work is based on weed control which is the most important problem faced by the farmers in developing countries. Considerable efforts have been invested in developing alternatives to traditional smallholder weeding technologies and replace the conventional methods of weeding in order to reduce work load, labor and human effort, save time, improve yield of crop, enhance proper weed control and finally reduce the cost involved in farming. Designed Prototype of Farm equipment which would be an easiest way to perform weeding, spraying chemical and seeding, altogether consisting of three functions in one design and making the design a universal fit has been Analyzed, Fabricated, Tested and Evaluated based on the considered design criteria's. The weeder is driven by petrol engine to move in forward direction and the blade is attached at rear end is placed at the roots of weeds, once the engine get started then the blade start cutting the weeds and using cam system the seeding operation can be done, chemical spraying can be done .It is faster than the traditional method of removing weed, seeding and spraying.

Keywords : Weeding, Petrol Engine, Cam System

I. INTRODUCTION

India is agriculture based country. Near about 60% people of our country are farmers. Our economy also depends on agricultural products. Nowadays tremendous changes have occurred in conventional methods of agriculture like seed plantation, irrigation system, pesticides and spray used. For developing our Economic condition, it is necessary to increase our agricultural productivity and quality also agriculture is the backbone of Indian economy. India being developing nation agriculture and industries based on agriculture products has prime importance in the national economy. Majority of the Indian population depends on agriculture and agro-based industries and businesses.

Figure 1. Weed Removing Process

The weed should be controlled and eliminated at their early stage. Depending upon the weed density, 20 to 30 percent loss in grain yield is quite usual which might increase up to 80 per cent if adequate crop management is not practiced.

Every year in INDIA, an average of 1980Cr of rupees is wasted due to weeds. Our country faces the total loss of 33% of its economy from Weeds. The Losses are due to some of the following reasons; total loss of 26% from Crop Diseases, total loss of 20% from Insects and Worms, total loss of 6% from Rats has been surveyed.

Manual weeding requires huge labour force and accounts for about 25 per cent of the total labour requirement. In India this operation is mostly performed manually with khurpi or trench hoe that requires higher labour input and also very tedious and time-consuming process. Moreover, the labour requirement for weeding depends on weed flora, weed intensity, time of weeding and soil moisture at the time of weeding and efficiency of worker.

Weeds can be removed by manual or mechanical weeding .Manual weeding is the use of hands or handheld tools to remove weeds .Mechanical weeding is the use of powered tools and machinery to eliminate weeds.

II. METHODOLOGY

Successful model designing begins with a logical and systematic plan. Model design is a five step problem solving process. The following is a detailed analysis of each step.

Step 1: Problem Analysis

To initiate the design process, we clearly state the problem to be solved. State the requirements as broadly as possible, but specifically enough to define the scope of the design project.

Step 2: Gather and Analyze Information

Collect all the relevant data regarding problem and assemble for evaluation. The main sources of information are weeding, seeding and chemical spraying activity. Design considerations need to be taken into account.

Step 3: Designing Concepts

A brainstorming session should be conducted to come up with several good design alternatives.

Step 4: Concepts Evaluation and Selection

The fourth phase of the design process is analysis of different options using evaluation matrix.

Step 5: Fabrication

This phase of the design process consists of turning the chosen design approach into reality. The model is then fabricated as per specifications and checked if all the mechanisms work efficiently.

Step 6: Testing and Implementation

The equipment is tested to check if it meets all the objectives. Finally the equipment is checked again if there are improvements or alterations to be made. After testing the model completely it is then implemented.

Step 7: Result and Final report

The output calculated during testing the equipment on the field are tabulated .Then submission of final report.
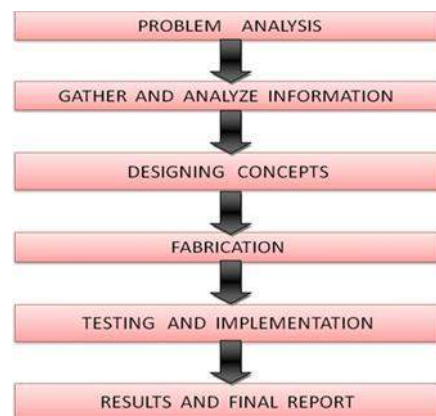
Fig 2: Flow Chart of Methodology

III. DESIGN & FABRICATION OF THE PHYSICAL MODEL

A. Bevel Gear

Bevel gears are gears where the axes of the two shaft intersect and the tooth bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

Number of teeth: 16

Figure 3. Bevel Gear

B. Main Wheel

Diameter: 30cm
Material: Rubber

Fig 4: Main Wheel

C. Base Frame

Length: 60 cm
Breadth: 50 cm

D. Ball Bearings

Spherical roller bearings have an outer ring with an internal spherical shape. Spherical roller bearings can thus accommodate both static and dynamic misalignment. The bearings have higher friction than an ideal cylindrical or tapered roller bearing since there will be a certain amount of sliding between rolling elements and rings. Number of bearings used is about 6.

Inner Diameter : 2cm
Outer Diameter: 4cm

E. Seed Container

Length: 20 Cm
Breadth: 20 Cm
Height: 20 Cm

F. Engine

Engine type: single cylinder , 2 stroke Fuel: petrol
Fuel tank capacity: 0.5L Weight: approximately 10.5 kg

G. Chain and Sprocket

This is a standard sprocket which is made of C30 steel with the outer diameter as 185mm with inner diameter as 44mm with 44 number of teeth which is matching to the chain and used in this work.

Fig 7: Chain and Sprocket

H. Lead Battery

Cycle Use   : 14.4-15.0 V
Stand By Use : 13.5 13.8 V Initial Current is less than 2.25 A

I. Other Specifications

Sprayer Tank Capacity : 3
Litres Nozzle Diameter: 1mm
Grass Cutter Dia   : 12 Cm
Circular Plate Dia   : 17 Cm

V. TESTING

A. Testing of Weeding Operation

The weeding unit was first subjected to testing, where in order to measure the weeding efficiency an area with weeds was analysed and an area of 1 square feet was marked so that the number of weeds before and after the operation could be noted. The above field testing figures shows the

number of weeds before the operation and after the operation.

Before   After

Fig 8: Testing of Weeding Operation

B. Testing of Seeding Operation

With the use bevel gear, seeding is done at a uniform distance with a help of cam system .

Fig 8: Testing of Seeding Operation

C. Testing of Spraying Unit

Fig 8: Testing of Spraying Unit

V. CALCULATION

A. Gear Ratio

As we need drive sprocket to be bigger than driven sprocket,
- No. teeth in drive sprocket (bigger) = 44 teeth
- No. teeth in driven sprocket (smaller) = 14
- Therefore gear ratio of these two sprocket= 44/14
- Gear ratio = 3.143

B. Blade Angle

The blade angle of the Spreader bar plough which is also the angle of attack is decided as about 15deg which will produce good Removal of weeds.

C. Weeder Efficiency

$$We = \{(N1 - N2)/N1\} * 100$$

$$= \{(10-1)/10\} x100 = 90\%$$

Where N1 and N2 are the number of weeds before and after weeding operation

D. Field Efficiency

$$Fe = (T_e/T_t) * 100 =$$

$$(72sec/80sec) x100 \quad Fe = 90\%$$

where T_e and T_t are useful and total time respectively.

VI. RESULTS AND DISCUSSIONS

Table I. Time Comparison Between Manual Method And Using Machine

Parameter	Manual Method	Through this Machine	Percentage Time Saved
Time taken for weed removal per person	20 hours	3 hours	70.86%
Time taken for fertilizer distribution per person	1 hour	------------	100%

Table II. Result of Fertilizer Feeding

Parameter	Standard	Manual	Using Machine	Difference
Amount of fertilizer fed per crop	3 grams	Uneven distribution	3.28 grams	0.28 grams

In traditional method of weed removal process for a person per acre it takes around 20 hours and for fertilization it takes another 1 hour. In our machine it takes around 3 hours to complete the weeding of an acre land and it completely saves time for fertilizer spreading. This machine ensures the uniform feeding of fertilizers to the each crop that is 3grams to each crop and it can be adjustable as for our requirement. It is time saving and economical machine as it performs two tasks at same time.

IV. CONCLUSION

As study says that in our country about 70% of population lives in villages & their mainly income depend on the agricultural source. Hence the prominent aim of this project is to complete the weed removing and fertilizer spreading in same time.

The above topic shows the details of agricultural technology, this machine can be used to reduce labour cost and time of a middle class and small sector farmers. This is the little effort to make comfort to farmers also this machine is manufactured in less cost as compared to other machines. The result from this project outcomes are assurance of much efficiency, less time consuming, worker friendly machine respective to the conventional method of weeding. It assures the maximum work done with minimum work effort. It has solved the problem of traditional way of Fertilization.

Also the project learn to fabricate any model according to its requirements. All the manufacturing process are carried out with the great concentration; any wrong calculation may have result in the failure of model. And this equipment saves the fuel for the larger extent because here we don't use any fuel for its working. At the same time environment pollution can also be reduced. Thus aiming to save the revenue of government & also most demanded fossil fuel.

Practically our multipurpose agricultural equipment can be used for tilling, fertilizing, sowing, levelling and also used for weed removal purposes. All the parts are connected in such a way that in every stage of agriculture the equipment can be rearranged or easily assembled with fasteners to required length and specifications of field operation.

Our team has successfully combined many ideas from various fields of mechanical engineering and agricultural knowledge to improve the yield and by reducing the labour effort and expenses. The whole idea of multipurpose equipment is a new concept, patentable and can be successfully implement in real life situations.

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Influence of Graphene in Natural Rubber Latex

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ABSTRACT

Rubbers are by and large vital materials, can be custom-made by adding fillers to meet the requests flexible industry applications generally Vehicle (elastic) tires are comprised of carbon black, it will experience more pressure, when its surface interacts with the street for a more drawn out timeframe, it is watched that there will be more wear, so to defeat this issue tires materials are joined or blended with GRAPHENE alongside the CARBON BLACK, this will likewise enhances the wear opposition and furthermore it diminishes the heaviness of the tire by a specific sum, in this manner expanding the fuel effectiveness. Graphene is artificially inactive this keeps it from having connection with elastic when they were combined. Other than that, graphene applications likewise being restricted because of its low solvency. Additionally, since graphene is nano filler, the sum included into the elastic will be less. Keeping in mind the end goal to accomplish the improvement of the properties of elastic, the nano filler should be all around scattered and homogenized with the elastic. In this way, so as to build the interfacial collaborations, subordinates of graphene, graphene oxide (GO) and diminished/ reduced graphene oxide (rGO) were utilized. As both of the GO and rGO bears oxygen- containing practical gatherings, which empower them to scatter well in acetone and furthermore in elastic. Subsequently, the properties of graphene are being held. Presently a days, CB faces a few difficulties since it is gotten from raw petroleum, it produces over the top squanders and the mechanical properties like wear obstruction. Keeping in mind the end goal to enhance the wear opposition, in exhibit work we are utilizing graphene in fortification for regular elastic latex. The utilization of Graphene alongside carbon dark (CB) in Natural elastic latex it indicates changes in mechanical properties like wear opposition

Keywords: Graphene, Carbon black, Natural rubber latex, Wear test, Automobile tire.

I. INTRODUCTION

Graphene is a material made of carbon iotas that are reinforced together in a rehashing example of hexagons. Graphene is thin to the point that it is viewed as two dimensional. Graphene's level honeycomb design gives it numerous unprecedented qualities, for example, being the most grounded material, and in addition one of the lightest material on the planet. The graphene has risen as another layered carbon material with nano estimate impacts and special physical properties.

Rubbers with fillers have been broadly connected in different modern fields because of their extraordinary mechanical properties, warm solidness and oil opposition. One of the businesses that requires enormous measure of filled elastic is the tire business. Tires are the fundamental piece of vehicle enterprises, at whatever point old tires wear off after a separation of mileage was voyage and new tires are required for substitution, there is an interest for it. Because of the popularity of tires, tire industry has turned into the significant customer of regular

elastic. The most broadly utilized filler for elastic in tire industry is carbon black.

Countless research contemplates have shown whereby consolidating little measures of particulate fillers, for example, carbon- black can present noteworthy changes in the mechanical and physical properties in elastic. Strengthening with various kinds of fillers is fundamental for rubbers, as unfilled rubbers have extremely limited applications because of their poor mechanical and physical properties. The fuse of filler ready to adjust the mechanical properties of the elastic, for example, modulus, firmness, stress softening effect, wearing and tearing opposition, hardness, rigidity and so on. Throughout the previous two decades, polymer nano composites have much consideration overall scholastically and modernly. The fuse of nano fillers, for example, graphene, graphene oxide and lessened graphene oxide into polymer grid makes materials that show enhanced physical, mechanical, unique mechanical, warm, and so on properties. [1]To enhance the thermo-oxidative maturing obstruction of normal elastic, a sort of functionalized graphene (FGE) was utilized. In contrast with graphene oxide (GO), FGE seemed more twisted surface and achieved the higher water contact edge of 134°. By latex-blending strategy, the consistently scattered FGE blessed NR vulcanizes with clearly enhanced warm solidness. Vitally, the NR/FGE nano-composites showed incredible thermo- oxidative maturing obstruction, which was credited to not just the synergistic antioxidative impact of upset phenol gatherings and bonds, yet additionally the hindrance part of graphene sheets to oxygen. Discoveries give another procedure to plan functionalized graphene as powerful cancer prevention agent for elastic and other polymer materials

Sliding wear test demonstrated that the wear parameters of NBR nanocomposites have essentially progressed. The consolidation of graphene in NBR has diminished coefficient of friction2.3 times more than that of graphite fused NBR.[3] Synthesized sans zinc coupling operators (ZFC)and ZFCs-

functionalized graphene (GZFCs), and created GZFCs-implanted SBR with noteworthy improvement in mechanical, warm, and electrical properties. The GZFCs-elastic composite indicated upgraded dry and wet braking and moving obstruction because of improved scattering and solid interfacial association of GZFCs in the silica/elastic matrix.[4] Mechanical quality of nanocomposites were improved with the expansion of oxidation level of GO. This work recommended that GO with higher oxidation degree could adequately enhance the properties of SBR/XNBR blend.[5] The unblemished graphite was first oxidized by Hummers strategy to plan graphene oxide (GO), and afterward graphene was gotten by concoction lessening of GO. The mechanical properties, dynamic properties and inner warmth ascent of GE/NR nanocomposites have been researched in detail. Results demonstrate that GE/NR nanocomposites include the enhanced mechanical properties, dynamic properties and low inside warmth rise. It is watched that when graphene is blended with normal elastic latex there is a change in mechanical property. The capability of rGO as a promising Nano filler in common elastic has been demonstrated.

II. EXPERIMENTAL SET UP

The distinctive Equipment's and materials which are utilized as a part of the present work are said beneath. Equipment's:(a) Stirrer (b) Electric oven (c) Wear testing machine (d) Weighing machine (e) Beaker (f) Dropper

2. Materials:

(a) Graphene powder (b) Natural rubber (c) Zinc oxide (d) Stearic acid
(e) Sulphuric acid (f) Sulphur (g) Acetone solution

Figure 1. Materials used

Procedure For Composite Preparation

STEP 1: Legitimate proportion of the got GO colloid containing 0.35% Weight and characteristic elastic latex of 20% weight and acetone are blended by overwhelming mixing by 40 min.

(a)   Addition of acetone   (b) stirring of mixture

Figure 2. Procedure for composite preparation

STEP 2: The GO/VPR/NATURAL RUBBER emulsion is then co-coagulated by 1% weight by Sulphuric corrosive arrangement

Figure 3. Emulsion is coagulated by Sulphuric acid solution

STEP3: The coagulated composites are washed with water until the ph of the filtered water reached 6-7 and then dried in oven about 50 degree Celsius until dried.

Figure 4. (a)Pouring colloid into sheet metal model (b) Sheet metal model is placed in oven

STEP4: The dried composites were aggravated with elastic fixings, and they are. Definition

GO/NATURAL RUBBER composites is as per the following

(a) 90 gm of natural rubber (b) 0-5 gm of graphene oxide (c) 5 gm of zinc oxide (d) 2gm of stearic acid

(e)   3 gm. of antioxidant (4010NA) (f) 2.8 gm. of sulfur

Trial No 1:

The elastic (rubber) fixings are blended amid the vulcanization and it is being filled bite the dust for relieving and the shape configuration is given beneath.

Figure 6. Die for curing

The pass on which we outlined had not given the final result (i.e. the normal elastic composite example) as wanted by our measurements so it won't be considered for the following procedure.

Trail No 2:

The kick the bucket was supplanted by utilizing the beneath said figure.

Figure7. (a)Hallow pipe of dia 8mm (b) Rectangular rubber tire specimen

Utilizing mellow steel empty pipe granulated front bit like cone, play out the punching task on the rectangular elastic tire formed example which we have done through the vulcanization with the goal that the coveted shape is gotten for the testing.

The above strategy likewise not gave the coveted state of the example, so this was additionally not considered.

Trail No 3: In this technique we arranged a sheet metal example which is in the tube shaped shape , so the elastic which has experienced the vulcanization procedure, we simply pour the vulcanized elastic in the empty sheet, at that point we got the correct shape required for testing.

Figure8. GI Sheet metal of cylindrical shape

Figure 9 demonstrates that the elastic latex is being filled a few number of the sheet metal to get examples and it is subjected to normal cooling.

Figure 9.Rubber latex is poured in to cylindrical shape sheet metal.

Preparation of the specimen

Elastic example acquired from vehicle tire and in addition characteristic elastic blended with the graphene examples should be set up with the ASTM measures which assistant tried in the wear testing machine.

Step1: Natural rubber latex is taken with a weight of 90ml in the beaker, here the latex means suspension of a microscopic natural rubber particles in an aqueous medium.

Step2: Graphene is added to the natural rubber along with the carbon black, the color of carbon black is similar to that of the graphene which gives the strength to the rubber material. It should be subjected to stirring. Graphene is added about 0.5 to 2.5gm.

Step3: The blending is the most vital factor in this procedure in light of the fact that the graphene material ought to be totally broken down in the elastic latex which gives the coveted quality and so as to make the graphene material all around scattered in normal elastic, acetone will be included.

The blend will be subjected to mixing under the stirrer for around 20-30 min by keeping up the speed of 40rpm.

Stage 4: The mixed blend is included with a 2-3 drops of sulfuric corrosive to coagulate the blend, and it brings about the colloid here the colloid implies arrangement which has a molecule extending between 1nm to 1000nm in breadth these substances stay scattered and don't settle down at base. Impact of Graphene in Natural elastic latex

Stage 5: Then the blend is subjected to warming in the broiler, and up to 150 degree Celsius it is warmed and later it is blended with the elastic fixings, for example,

Sulfur-2.8gm, Zinc oxide-5gm,Stearic corrosive 2gm, Acetone of 5ml,Accelerator CBS - 1.4gm.

The expansion of the sulfur is called vulcanization, something imperative is that if the vulcanization specialist introduce before beginning of blending it will brings about the untimely vulcanization.

Stage 6: The acquired item is taken out from the oven and it is subjected to characteristic room temperature cool until the point that it is totally dried.

Example arranged according to that is ASTM D412 principles, for the wear testing, the item will be gotten
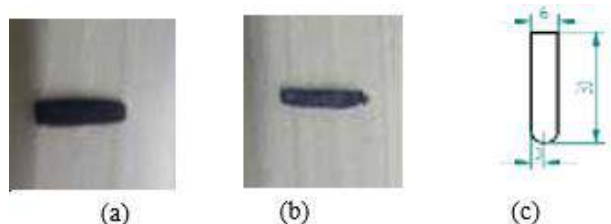
Figure 10. (a) Rubber specimen without graphene added. (b) Rubber specimen with graphene added (c) Actual dimension of specimen.

C. Pin and Disc Experimental Set Up For Wear Test

Figure 10. Wear testing apparatus

Emery paper / sheet is used on a disc to provide more friction between disc and specimen. Used emery paper which is having a coarseness size of 120 grit.

III. RESULTS AND DISCUSSION

spe cim en	Time in min	Wear Rate in microns	Friction in (N)	Weight in gm (self + is 1500 gm)	Speed in RPM	Initial Weight In gms	Final Weight In gms	Difference (Ini-fin) in gms
1	10	10	0.5	2000	480	1.060	0.748	0.312
	15	9	0.7					
	20	9	0.7					
2	10	12	0.4	2000	480	1.157	0.856	0.301
	15	12	0.7					
	20	13	0.9					
3	10	10	0.3	2000	480	1.324	0.987	0.337
	15	10	0.4					
	20	11	0.4					

Table 1. Following table provides test results of rubber specimen

Graphene added in gms	specimen	Time in min	Wear Rate in microns	Friction in N	Weight Added in gm (self+1500)	Speed in RPM	Initial Weight in gms	Final Weight in gms	Difference (Ini-fin) in gms
0.5	1	10	11	0.8	2000	480	0.958	0.861	0.097
		15	10	0.7					
		20	12	0.5					
1.5	2	10	9	0.9	2000	480	0.956	0.066	0.066
		15	7	0.8					
		20	6	0.8					

Table 2. Following table provides test results of graphene specimen

Time in min	Wear rate (microns)
5	-
10	12
15	12
20	13

Table 4. For specimen 2

Figure 12. Specimen2 without addition of graphene.

The above figure 12 plainly demonstrates that the wear rate is expanding for elastic example, where it was indicating wear rate of 12 microns at 10 minutes and when it came to 15 min it has demonstrated the consistent wear and wear rate got slowly expanded to 13 microns in 20 minutes.

Time in min	Wear rate (microns)
5	-
10	12
15	12
20	13

Table 5. For specimen 3

Figure 12. Specimen 3 without addition of graphene.

Here the above diagram demonstrates that the wear rate is diminishing for elastic example from 10 microns to 9 microns, when the time scopes to 15 and 20 minutes the chart is demonstrating the steady wear rate for elastic example, since it is an elastic example, the wear rate may increments or it might demonstrate the consistent wear rate in the following 20 minutes of trail on keeping the load consistent.

Charts and table shows results for graphene example:

Table 6. For specimen 1

included, here the graphene expansion has not demonstrated the huge outcome, since it is demonstrating the comparative properties of the elastic example where wear rate got expanded to 12 microns at 20 minutes of time term when at first it was observed to be 11 microns.

Table 7. For specimen 2 1.5gm of graphene added

Figure 14. Specimen with 1.5 gm addition of graphene.

The outline exhibits that the wear rate is growing as the time proceeds when 0.5gm of graphene is

0.5gm of graphene added
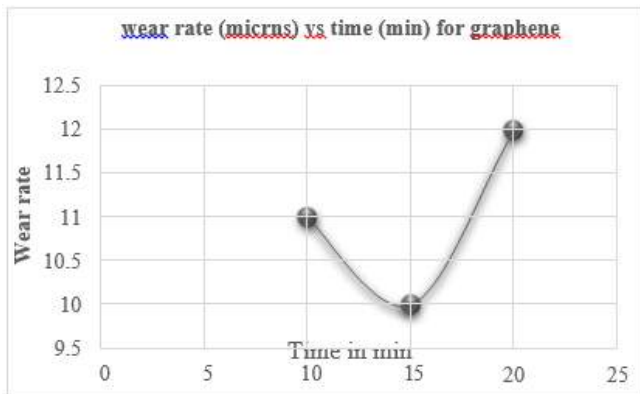
Figure 13. Specimen with 0.5 gm addition of graphene.

The chart demonstrates that the wear rate is expanding as the time continues when 0.5gm of graphene is incorporated, here the graphene extension has not shown the tremendous result, since it is exhibiting the similar properties of the versatile case where wear rate got extended to 12 microns at 20 minutes of time term when at first it was seen to be 11 microns.

Table 8. For specimen 3 2 gm of graphene added
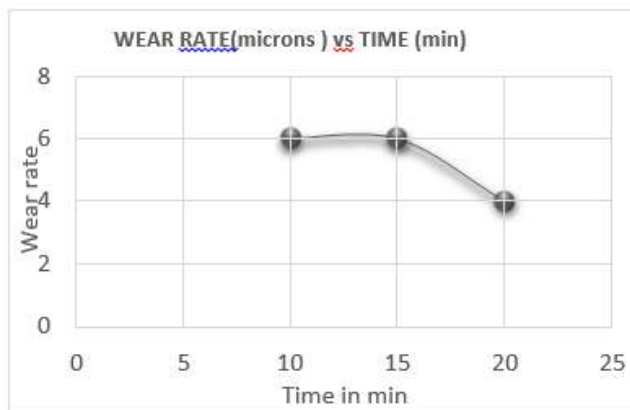
Figure 15. Specimen with 2 gm addition of graphene.

The above chart demonstrates that wear rate is diminishing as the time builds the option of 2gm of graphene has given the better outcomes when it is contrasted and the over two diagrams of fig 13 and 14 where we have included 0.5 gm and 1.5 gm of graphene. We can likewise saw from this chart at first there was a 6 microns of wear rate at 10 minutes of time and it was diminished to 4 microns

at 20 minutes, the test unmistakably finishes up when there is an expansion in the graphene organization with elastic latex better outcomes can be acquired.

Percentage of weight reduction calculation.

Percentage of weight reduction = (initial-final) weight
/initial weight.
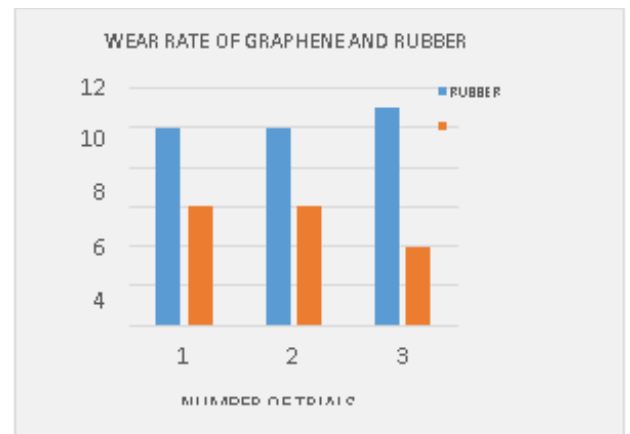
Figure 16. Compression of results

IV. FUTURE WORKS

The normal elastic (rubber) which we have utilized can be supplanted by the SBR latex that is styerene butadiene elastic latex so as to enhance the further mechanical properties for instance to enhance the quality, since SBR has gotten from the oil based commodity.

The vinyl pyridine elastic can be used for enhancing the coupling properties at whatever point SBR latex is utilized as a part of an extensive amount.

Numerous quickening agents, for example, 4010NA and additionally activators can be used in a particular sum contingent on the general arrangement of the normal elastic latex and graphene considered.

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Work Hardening Characteristics of Non-Heat Treatable Aluminium Alloys

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ABSTRACT

Aluminium is the most widely used material for applications such as cooking utensils, food processing equipment, storage tanks, aircraft components, pressure vessels, ladders, railings, frames, tool boxes, truck bumpers components in truck and automobile industries, which requires strength and good formability. In this study, it is aimed to present the experimental results of studies conducted on strain hardenable characteristics of non-heat treatable casted and forged aluminium alloys using tensile test.. Pure aluminium, Aluminium alloy 5052 and Aluminium alloy 3003 are the chosen materials for the work. Strain hardening conditions selected are H12 and H14 on specimens as per ASTM standards. This paper involves graphs of true stress v/s strain as per the results obtained from tensile test on different heat treatment conditions.

Keywords : Strength, Formability, Characteristics, Strain Hardening, Aluminium alloy, H12-Half hardened, H14- Quarter hardened

I. INTRODUCTION

Non-heat treatable aluminium (NHT) alloys are utilized in all of the main industrial markets for aluminium flat-rolled products. Transportation, packaging and the building/construction sectors have represented the greatest utilization of NHT sheet all through the last phase of the 20th century. Higher performance non-heat treatable alloys have been developed for new and present applications ranging from foil to high electricity structural products. Work hardening, also known as strain hardening, is the strengthening of a metal by plastic deformation. This strengthening occurs because of dislocation movements and dislocation generation within the crystal structure of the material. Most non-brittle metals with a reasonably high melting point as well as several polymers can be strengthened in this fashion. Alloys not amenable to heat treatment, including low-carbon steel, are often work- hardened. Some materials cannot be work-hardened at normal ambient temperatures, such as indium, however others can only be strengthened via work hardening, such as pure copper and aluminium. Work hardening or cold working is an important industrial process that is used to harden metals or alloys that do not respond to heat treatment.

The chosen materials consist of following chemical composition. The composition of pure aluminium has not illustrated here.

Table 1. Chemical composition of Al-3003 alloy

Element	% Present
Manganese (Mn)	1.10 - 1.50
Iron (Fe)	0.0 - 0.70
Copper (Cu)	0.05 - 0.20
Magnesium (Mg)	0.0 - 0.05
Silicon (Si)	0.0 - 0.60
Zinc (Zn)	0.0 – 0.1
Others	0.0 – 0.15
Aluminium	Balance

Table 2. Chemical composition of Al-5052 alloy

Element	% Present
Manganese (Mn)	0.0 - 0.9
Iron (Fe)	0.0 - 0.39
Copper (Cu)	0.0 - 0.10
Magnesium (Mg)	2.20 - 2.80
Silicon (Si)	0.0 - 0.25
Zinc (Zn)	0.0 - 0.9
Chromium (Cr)	0.15 - 0.24
Others (Total)	0.0 - 0.14
Aluminium (Al)	Balance

II. METHODOLOGY

A. Preparation of castings

In the present study castings of pure Al, Al-3003 alloy and Al-5052 alloys are produced using sand casting process. The shape of moulds is cylindrical sand moulds. Green sand used in the study has following ingredients:

Silica (SiC2) Sand - AFS: 25

Clay Binder   - Bentonite   : 11.2%

Moisture content   : 3.25

Additives - Coal dust   : To improve Surface Finish.

In the present study three materials have been selected which are procured in the form of ingots.

Pure Aluminium

Al – 3003 alloy &

Al – 5052 alloy

These materials are kept in a crucible of 5 kg capacity, and heated at different temperatures for their melting. The melting temperatures are shown below.

Pure Aluminium   700oC

Al – 3003 alloy 800 oC

Al – 5052 alloy 800 oC

Molten metal obtained from crucible is poured into the cylindrical moulds prepared and allowed it to solidify. Finally we have produced 6 castings from each material.

Fig.1 Casting

Fig.2 Casted specimens

The three (3) castings of each material are kept in a forging furnace at 450 oC for 1 hour. The heated specimens are then hand forged using hammers and then the forged specimens are cooled to atmospheric temperature. In total, 9 casted and 9 forged specimens are produced from three materials. The forged specimens are further subjected to stress relieving to remove internal stresses.

Fig.3 Forging

Fig.4 Forged specimens

B. Preparation of Testing specimen

All the materials, 9 casted and 9 forged materials are machined to produce tensile specimens. And specimens have been prepared as per ASTM standards.

Fig.5 tensile specimens

C. Tensile

Tensile strength is among the most important properties of engineering materials. Universal Testing Machine (UTM) was used to conduct tension test and to find the ultimate tensile strength of 18 specimens.

III. RESULTS AND DISCUSSION

The tensile test has been conducted on different specimens with different hardened conditions. From testing, a good relation has been obtained between strength and various parameters such as work hardening effect, manufacturing process effect, work hardening rate. The true stress v/s true strain curves for all specimens are plotted for different conditions and are shown below.

A. Effect of work hardening on Strength
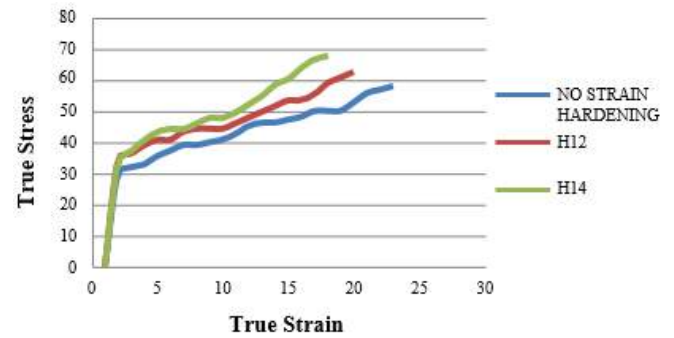
Fig.6 Graph shows effect of work hardening on strength of pure Al
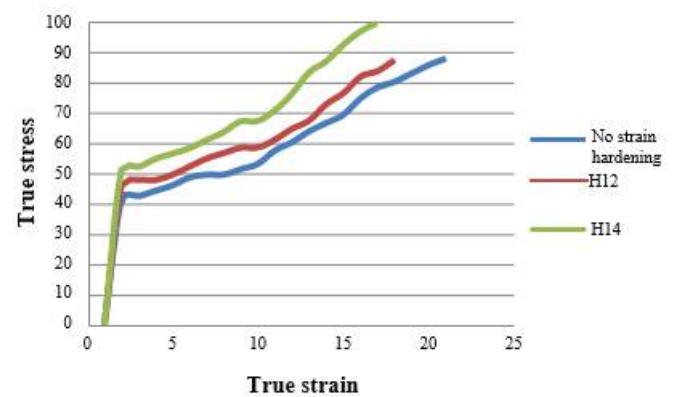
Fig.7 Graph shows effect of work hardening on strength of Al-3003.
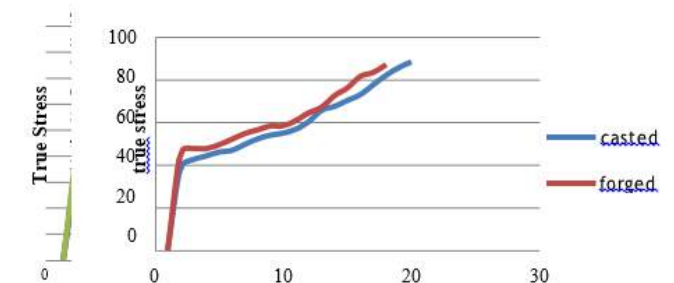
Fig.8 Graph shows effect of work hardening on strength of Al-5052

From the above graphs, it is clear that the strength of the material has increased with strain hardening for forged specimen of pure aluminum, Al-3003 and Al-5052 than the specimen without strain hardened (casted). This is due to increase in stress required for dislocations to move as the material is unloaded and reloaded with strain hardening.

B. Effect of manufacturing process on work hardening.
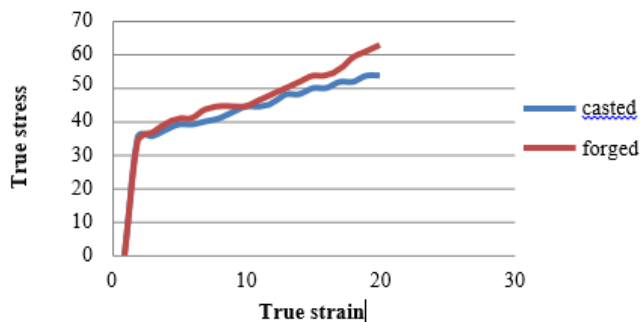
Fig.9 Graph shows effect of manufacturing process on Pure Al for H12 work hardened condition
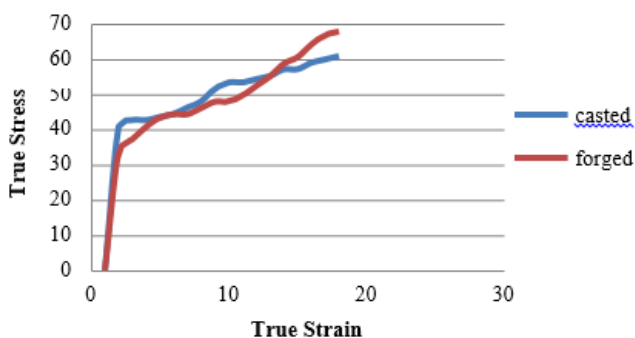
Fig.10 Graph shows effect of manufacturing process on Pure Al for H14 work hardened condition
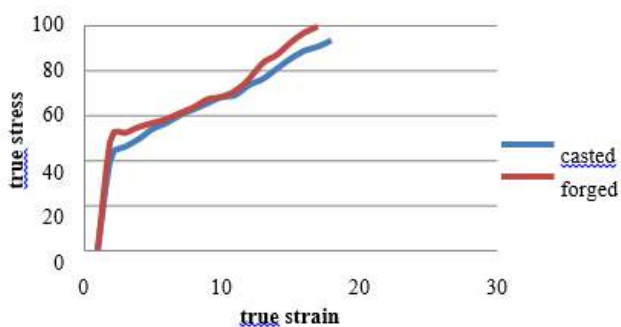
Fig.11 Graph shows effect of manufacturing process on Al- 3003 for H12 work hardened condition
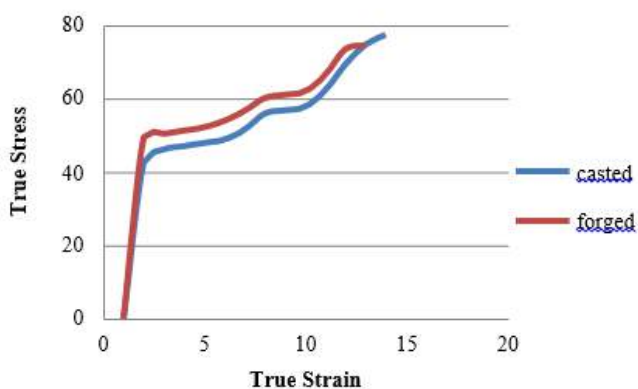
Fig.13 Graph shows effect of manufacturing process on Al-5052 for H12 work hardened condition
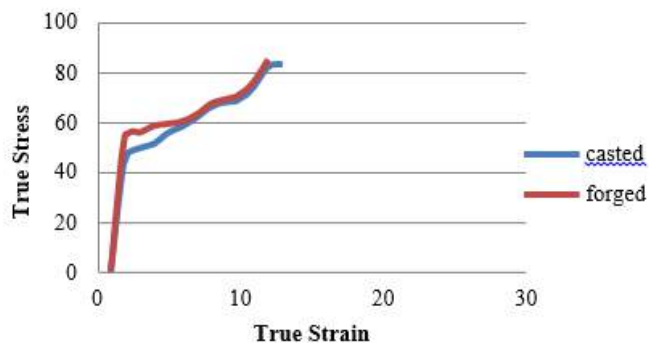
Fig.14 Graph shows effect of manufacturing process on Al- 5052 for H14 work hardened condition

From the above graphs, it is evident that forged specimens of pure aluminium have shown better work hardening characteristics than casted specimens under all strain hardening conditions.

V. CONCLUSION

Based on the experimental data obtained and observations made in the present study, it is concluded as below. Strain Hardening increases the strength of non- heat treatable alloys considerably. Forged specimens have shown greater work hard enable characteristics and greater strengths than casted specimens. H14 and H12 conditions show greater characteristics than without strain hardened condition. Strain hardening rate and strength are inversely proportional to each other.

ACKNOWLEDGMENT

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Performance Analysis of Bank Conference Room AC Design: A Case Study

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ABSTRACT

Delamination in laminated composite structures usually initiate from discontinuities such as matrix cracks and free edges or from embedded defects due to the manufacturing processes. Therefore, it is important to analyze the progressive growth of delamination in order to predict the performance of a composite structure and to develop reliable and safe designs. Virtual Crack closure Technique (VCCT) is a fracture mechanics approach which is widely used to compute energy release rates. Cohesive Zone Method (CZM) is a progressive event governed by progressive stiffness reduction of the interface between two separating faces which uses bilinear material behavior for interface delamination and these two methods are used to analyze the delamination of multidirectional composite Double Cantilever Beam (DCB) specimen in a Commercial Finite element Package called ABAQUS. The proposed methods are validated with the benchmark results and load-displacement curves are plotted using both the methods. The strain energy release rates are found out using VCCT and a parametric study is performed by varying the crack lengths.

Keywords: Delamination, Virtual Crack closure Technique (VCCT), Cohesive Zone Method (CZM), stiffness, Double Cantilever Beam (DCB)

I. INTRODUCTION

Delamination forms on the interface between the layers in the laminate. The analysis of delamination is commonly divided into the study of the initiation and the analysis of the propagation of an already initiated area. Delamination may form from matrix cracks that grow into the inter-laminar layer or from low-energy impact. De-bonding can also form from production non adhesion along the bond line between two elements and initiate delamination in adjacent laminate layers. Under certain conditions, delamination's or de-bonds can grow when subjected to repeated loading and can cause catastrophic failure when the laminate is loaded in compression.

The Double Cantilever Beam (DCB) is used to access the mode I failure strength of composite laminate with all plies. In this type of failure mode, the load is applied on the cantilever arms and the crack propagates in the direction perpendicular to the applied load. In this case, no shear at the crack tip of delamination exists. Hence, the crack growth is due to the out-of-plane load. For this crack growth, we term as "Mode-I" fracture. When the crack advances, the de-bonding takes place between the interfacial surfaces leading to the fracture, releasing the energy which is resulting in delamination. The energy that is dissipated in this process is coined as strain energy release rate or fracture energy pertaining to the DCB. During this process of crack propagation, the applied

load will assist in increasing the energy associated with the cantilever arms and thus succeeds in attaining an energy level which is equal to or greater than the threshold barrier energy.

The strain energy release mechanism is controlled at least partially by the structural interaction between plies during loading the laminate. Since this interaction can be altered by the kinematics of the crack, the energetic argument provides not only a criterion for crack growth but also for the kinematic effects such as growth stability.

Fig 1: Modes of Failure

Fig 2: Double Cantilever Beam with Load

II. THEORY AND CALCULATION

This paper evaluates to perform progressive damage simulation of the below mentioned DCB specimens with both unidirectional and multi directional composites by using Virtual Crack Closure Technique (VCCT) and Cohesive Zone Models (CZM)

Fig 3 : Multidirectional Double Cantilever Beam specimen

The Carbon-Epoxy multidirectional composite double cantilever Beam specimen is as shown in the above Fig 3. It has 32 plies having stacking sequence and the delamination is at the 16th ply. For this specimen progressive damage simulation of a Double Cantilever Beam specimen is carried out and the strain energy is evaluated using Virtual Crack Closure Technique method.

Fig 4 : Unidirectional Composite Specimen specification

Fig 5 : Multidirectional composite beam specifications

Table 1: Material Properties of the DCB specimen

Material	Graphite/Epoxy
Young's Modulus in 1st direction	146.9 Gpa
Young's Modulus in 2nd direction	10.6Gpa
Young's Modulus in 3rd direction	10.6Gpa
Poisson's ratio 1-2 direction	0.33
Poisson's ratio 2-3 direction	0.33
Poisson's ratio 3-1 direction	0.33
Shear modulus 1-2 direction	5.45Gpa
Shear modulus 2-3 direction	5.45Gpa
Shear modulus 3-1 direction	3.99Gpa
Stacking Sequence for multidirectional specimen	[30/-30/0/-30/0/30/0$_4$/30/0/-30/0/ 30/30±30/30/0/30/0/-30/0$_4$/-30/0/30/0/30/-30]

Table 2: Material Properties of the unidirectional specimen

Material	Graphite/Epoxy
Young's Modulus in 1st direction	150 Gpa
Young's Modulus in 2nd direction	11 Gpa
Young's Modulus in 3rd direction	11 Gpa

Poissons ratio 1-2 direction	0.25
Poissons ratio 2-3 direction	0.45
Poissons ratio 3-1 direction	0.25
Shear modulus 1-2 direction	6 Gpa
Shear modulus 2-3 direction	3.7 Gpa
Shear modulus 3-1 direction	3.7 Gpa
Mode 1 critical energy release rate G1C	0.352N/mm
Maximum Normal stress σ_c	60 Mpa

Virtual Crack Closure Technique

The virtual crack closure technique (VCCT) is a well-established method for calculating the energy release rate (ERR) when analyzing fracture problems via the finite element method (FEM). The technique is based on the numerical implementation of Irwin's crack closure integral, as first proposed for two-dimensional problems and later extended to three-dimensional problems.. In recent years, the VCCT has gained great popularity for the study of mixed-mode fracture problems, such as the delamination of composite materials and interfacial fracture between dissimilar materials.

VCCT calculates energy release rate G, with the assumption that the energy needed to separate the surface is same as the energy needed to close the same surface area. This technique uses a contact or interfacial elements along a predefined interface of model.

Nevertheless, this type of modeling involves a fracture mechanics technique with large body work. Although the growth criterion is energy release rate, G which is the subject of interest but there are few assumptions that must be accounted for, before proceeding to model. They are

- Number of cracks
- Location of cracks
- Size of cracks

Cohesive Zone Modeling

Cohesive zone (CZ) models have been introduced by Dugdale and Barenblatt and have recently attracted a growing interest in the scientific community to describe failure processes and delamination in particular. Cohesive zones project all damage mechanisms in and around a crack tip on the interface, leading to a constitutive relation, or cohesive zone law, between the traction and opening displacement

As the surfaces (known as cohesive surfaces) separate, traction first increases until a maximum is reached, and then subsequently reduces to zero which results in complete separation. The variation in traction in relation to displacement is plotted on a curve and is called the traction-displacement curve. The area under this curve is equal to the energy needed for separation. CZM maintains continuity conditions mathematically; despite physical separation. It eliminates singularity of stress and limits it to the cohesive strength of the material.

Advantages of Cohesive Zone models are:
1) Interaction between crack faces is automatically incorporated and
2) It can be fitted on experimental data.

Cohesive zone models relate the relative displacement ("opening" Δ) of two associated points of the interface to the force per unit of area ("traction" T) needed for separation. Frequently – but not necessarily – a difference is made between normal (n) and tangential (t) direction, so the cohesive zone law comprises the two relations Tn(Δn) and Tt(Δt).

Cohesive zone laws can be uncoupled or coupled. In an uncoupled cohesive zone law the normal/tangential traction is independent of the tangential/normal opening. In a coupled cohesive zone law, both normal and tangential tractions depend on both the normal and tangential opening displacement. Uncoupled laws are intended to be used when the debonding process occurs under one mode – normal (mode-I) or tangential (mode-II) loading – or is largely dominated by one mode. The majority of cohesive zone laws have a (partial) coupling between normal and tangential directions, which is achieved by introducing coupling parameters in the model.

IV. FINITE ELEMENT ANALYSIS

The finite element method is a numerical technique for obtaining approximate solution by reducing the infinite degree of freedom to finite degree of freedom for a wide variety of engineering problem.

Fig 6 : Finite Element Modeling of DCB specimen with Boundary conditions

Fig 7 : Refine mesh at the crack tip

Fig 8 : Finite element modeling of DCB specimen using shell elements

Delamination analysis for a composite double cantilever beam specimen is carried out using commercially available FE package Abaqus. Finite element Modeling of the specimen is done in abaqus software and it is meshed using 3D hexagonal elements as shown in the fig 8. Fine mesh is done near the crack tip and at the edges and coarse mesh at the other surface. Right end of the Double cantilever beam specimen is fixed and a constant loading of 10N is applied at the other end as shown in the Fig 6.

A 3-D model is meshed using a SOLID C3D20R having 20 Nodes elements which is capable of modeling a composite structure up to 250 layers. While meshing the areas the aspect ratio is maintained in order to obtain the results accurately. Theoretically the thickness direction should contain a minimum of three nodes defining the surface and the number of nodes in the length and width (3-D) can be any arbitrary value. The meshing can be coarse at the junction and should be finer where the crack tip is present and the region around the tip. The rest of the specimen is not the subject of interest so the mesh can be coarse enough for the solution to converge.

Typically this de-bonding technique is implemented using a contact and target elements at the interface along with Virtual Crack Closure Technique. The Finite element modeling of the DCB specimen using 3D shell elements are as shown in the Fig 8. The 4 noded shell element with reduced integration scheme (S4R) has been used for the bulk material and the 8noded 3D (COH3D8) cohesive element has been used for model zero thickness cohesive zone. These cohesive elements will have the properties of the adhesives used in the DCB specimen and the young's modulus of adhesive used , normal traction force and tangential traction force are given as input to the Abaqus software.

V. RESULTS AND DISCUSSION

From the Fig 8, It can be noted that both the cantilever beams pull apart symmetrically from the crack face, thus signifying the vertical displacement of nodes on the crack face resulting delamination. This implies that there is a strong dominance of mode I loading in this condition.

Fig 9: Crack Propagation of DCB specimen using VCCT technique

Fig 9 represents Crack propagation of a double cantilever beam specimen using Cohesive Zone Modeling method. The blue elements in between the cantilever beams represent the cohesive elements. These cohesive elements are nearly zero thickness elements which are introduced in between the cantilever beams and these cohesive elements are introduced along the complete width of the specimen and will have the properties of adhesives and during crack propagation these elements are distorted and it will give clear indication of crack propagation across any direction of the specimen.

Fig 10: Crack propagation using CZM method

The Load and displacement curves are plotted for the multidirectional Double Cantilever Beam specimen using Virtual crack closure Technique and Cohesive Zone modeling approaches.

Fig 11: Load-displacement curves for VCCT and CZM

In Fig 10 it can be observed that the curve is linear up to failure (Onset of delamination), therefore critical load (Pcrit) and displacement (δcrit) were taken as maximum. The Load-displacement response was successfully modeled by both approaches. From the graph It can be noted that the load displacement curve which is obtained using VCCT traced a linear path till it reaches the critical load, and without any softening effect which implies that in binary contact conditions using VCCT, no stiffness degradation of the contact elements at the interface takes place and crack tip changes from bonded to open. On the other hand Cohesive Zone Modeling Estimated the Critical Load little less than that the Critical Load obtained from the VCCT because of the presence of the Cohesive elements at the interface which will have the same properties that of the adhesives used to bond the cantilever beams whose stiffness is very less than the beam elements which results in stiffness degradation and thus crack opening takes place little early. A Fairly good correlation can be observed between Virtual Crack Closure Technique and the Cohesive Zone Modeling methods from the graph.

A. Strain energy Release rate

The strain energy release rate is a fracture parameter which is used to measure delamination characteristics of composite laminates and it can be defined as "the energy dissipated during the crack formation for a newly created crack surface area" and denoted as G. the strain energy release rate for the multi direction composite double cantilever beam is calculated using Virtual Crack Closure Technique and

the computed strain energy release rate distributions across the width of the specimen are shown in Fig. 11
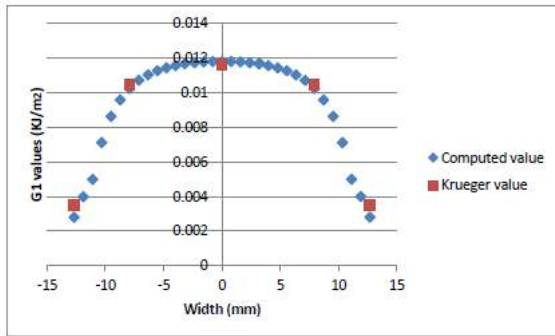
Fig 12: Strain Energy Release Rate vs. Width of the specimen

B. Progressive damage analysis of the DCB with unidirectional composite layups using CZM

Progressive damage analysis of the DCB specimen of unidirectional composite layups is done using Cohesive Zone Modeling method. The 4 noded plain strain elements are used for the bulk material and 4 noded cohesive elements are used for zero thickness cohesive zone. The propagated crack and the failed cohesive elements are as shown in the fig. The white colored elements in the interface show the failed cohesive elements. The Load vs. Displacement curve is plotted for the above specimen and it is compared with the experimental results. Loads are taken in 'N' and the crack opening displacement (COD) is in mm

Fig 13: Crack propagation of DCB specimen using CZM method

The Load-deflection curve is plotted for the above shown unidirectional specimen and it is

compared with the experimental results and the trends shows good agreement with the experimental results. The curve is linear upto the elastic portion (the rising curve). The load for which the 1st node in the cohesive zone fails, can be predicted by the finite element modeling. In the softening zone the trend first decreases which agree with the bilinear traction separation law which is specified as the constitutive law of the cohesive zone model. The later portion shows the diverging effect as the mesh becomes course. As the elements become finer the curve tends to come down. More the finer mesh the diverging curve will change and follow the bilinear law specified.

Fig 14: Load-deflection curve for the DCB specimen

C. Progressive Damage Analysis Of The DCB With Multi Directional Composite Layups Using CZM

The propagated crack and the failed cohesive elements are as shown in the Fig 14. The white colored elements in the interface show the failed cohesive elements. The Load vs. Displacement curve is plotted for the above specimen and it is compared with the experimental results. Loads are taken in Newton and the crack opening displacement (COD) is in mm.

Fig 15: Crack propagation of Multidirectional DCB specimen with shell elements

The Load-deflection curve is plotted for the above shown multi directional specimen and it is compared with the experimental results as shown in the Fig 15. It can be seen that the results obtained from the Abaqus agrees well with that of the experimental results. The use of shell elements gives better simulation than using the plain strain elements.

Fig 16: Load-deflection curve for multi directional DCB

It shows good agreement with experimental results both in elastic region and the softening portion. It can be seen that the graph follows bi-linear traction separation law with critical load occurring at 55.3 N and critical displacement at 2.30 mm which agrees well with the experimental results.

Table 3: Load-displacement values for multi directional DCB

Crack opening displacement (mm)	Load (N)	
	Experimental results	Abaqus results
1	24.33	24.35
2	47.88	47.88
2.30	53.11	55.32
3	47.61	50.64
4	39.90	43.62
5	37.29	38.12
6	34.40	35.64

D. Parametric Study For Different Crack Lengths
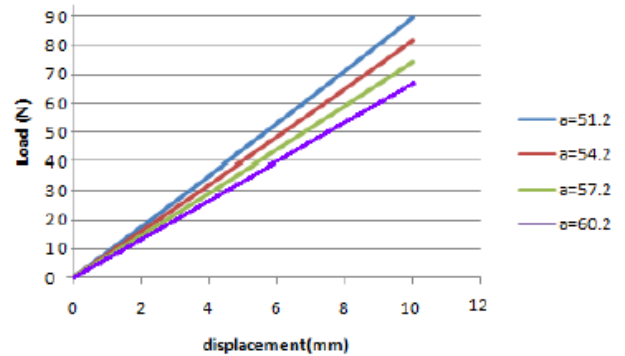
Fig 17 : load vs. displacement graph for different crack lengths

Parametric study is performed by varying the crack lengths for the Double cantilever beam specimen using Virtual Crack Closure Technique method. In the above graph Y axis denotes load and X axis denotes the crack opening displacement. From the graph it can be noted that as the crack length is increased, the load required for the crack initiation decreases. From the graph it is evident that for the same crack opening displacement the load required for the crack initiation decreases.

V. Conclusion

Progressive damage simulation of different Double Cantilever Beam specimens is carried out using Virtual Crack Closure Technique and Cohesive Zone Modeling methods. Load and displacement curves are plotted using both the methods. The results agree well for both the methods and it is validated with the experimental results.

Strain energy release rates is evaluated for the multidirectional double Cantilever Beam specimen for the given loading using Virtual Crack Closure

technique and it is validated with the results obtained from the literature review "A shell/3D modeling technique for the analysis of delaminated composite laminates", the results agrees well with the reference paper results and from the results it can be concluded that the strain energy release rate is maximum at the centre of the specimen and the energy release rates progressively dropping towards the edges.

A parametric study is also carried out by varying the crack lengths to study the behavior of crack propagation in a composite double cantilever Beam specimen to study the delamination. From the results it can be concluded that as the crack length increases the critical load i.e the load required for the crack initiation decreases and the crack propagates more early.

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Brand Equity Perspective from 1990 to Till Today

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ABSTRACT

Brand Equity is a very old & most important concept in marketing. In an overcrowded market, critical success factor for any company is building brand portfolio which gives a company competitive advantage against their competitors. Every organization is bound to focus on Brand equity which enhances customer satisfaction, higher profitability, and premium pricing & so on. However the determinants of brand equity have varied over time, brand equity is viewed from different perspective such as investor, employee, and customer. This paper seeks to identify brand equity dimension from customer perspective through reviewing various literature from 1980's to till date and to study how brand determinants have changed over a period and which elements are more relevant today.

Keywords : Brand Equity, Brand Determinants, Customer Based Brand Equity, Employee Based Brand Equity.

I. INTRODUCTION

Brand being intangible asset has lot of influence on the valuation of the firms, intangible asset are being valued at higher premium than the tangible assets because of numerous advantage firm can achieve such as lower transaction cost, premium pricing, steady demand, higher bargaining power, loyal customer, increased marketing communications, easy product extension, lesser time to market new brand & so on. So for any company prime focus is building a sustainable brand in the markets, but building strong brands is not so easy in a market which is very diverse as well as very dynamic.

The Goal of my study is first to comprehend the evolution of brand equity over a period and second to analyze the changes happened in the brand equity construct over time also to know those brand constructs which are more relevant in today's market environment.

A brand is – A name, a term, a symbol, or any other unique element of a product that identifies one firm's products and sets them apart from the competition (Solomon & Stuart, 2002).

Brand equity is defined as, a set of brand assets and liabilities linked to a brand, its name and symbol, that add to or subtract from the value provided by a product or service to a firm and/or to that firm's customers (Aaker, 1991).

Customer-based brand equity is defined as the differential effect that brand knowledge has on consumer response to the marketing of the brand. A brand has positive customer based brand equity when consumers react more favorably to a product and the way it is marketed when the brand is identified than when it is not on the other hand, a brand has negative customer based brand equity if consumers react less favorably to marketing activity for the brand compared with an unnamed or dishonestly named version of the product. Customer- based brand equity (CBBE) is used to show how a brand's success can be directly attributed to customers' attitudes towards that brand.

1. Brand Salience (who are you)

It looks at the brand from the customer point of view and about what buyers associate when they hear a specific brand name. In short, it quantifies both the depth and the breadth of customer awareness of a brand.

2. Brand Meaning (what are you) Performance & imagery are two aspects of brand meaning. The imagery-related associations depict how well the brand meets social and psychological needs of the consumer. The function-related association such as product or service performance is what the consumer looks for primarily. A brand with the right identity and meaning creates a sense of relevance in the consumer's mind.

3. Brand Responses
The companies must cater for the consumer's response. Keller segregates these responses into consumer's judgments and consumer's feelings.

Consumer Judgments are consumer's personal opinions regarding the brand and how he has put imagery-related and performance-related associations together. There are four types of judgments crucial for creating a strong brand – Quality, Credibility, Consideration, superiority.

Consumer Feelings – are consumer's emotional reactions to the brand. They can be mild, intense, positive, negative, driven from heart or head. There are six important feelings crucial in brand building – Warmth, Fun, Excitement, Security, Social approval & Self-respect.

4. Brand Resonance
It is the level of personal identification the consumer has with the brand. Brand resonance is the most difficult and highly desirable level to achieve. Keller categorizes this into four types Behavioral Loyalty – Consumers may purchase a brand repeatedly or in high volume.
Attitudinal Attachment – some consumers may buy a brand because it is their favorite possession or out of some pleasure.
Sense of Community – Being identified with a brand community develops kinship in the consumer's mind towards representatives, employees, or other people associated with the brand.
Active Engagement – Consumers invests time, money, energy, or other resources and participates actively in brand chat rooms, blogs, etc., beyond mere consumption of brand. Thus, the consumers strengthen the brand.

II. Literature Review

(keller, Kevin Lane, jan1993) Keller develops a conceptual model of brand equity from the perspective of the individual consumer. Studies how customer brand knowledge will have a differential effect on marketing of the brand which is defined as Customer- based brand equity.

(Lassar, Mittal, & Sharma, 1995) Developed an instrument to measure customer-based brand equity based on four perceptual dimensions such as performance, social image, price/value, trustworthiness and

identification/attachment. To begin with they asked 22 consumers open-ended questions as to why most people prefer a brand name product over unbranded or generic products, following it they generated 83 measurement items which

is screened by 3 marketing professors. These experts provided a content-based screening process by assigning individual items to the construct category they thought the item best indicated. Later administered the item pool to 75 consumers for a set of existing products (one product per respondent) with their brand names specified. They reduced the measurement items from 83 to 17 in three iteration. Tested the scale in two categories. The first is television monitors and the second is watches. In general they found that prices reflected the equity associated with the brand.

(D. A. Aaker, 1996)The article by Aaker,1996 provides a framework by using it we can measure the strength of a brand. It evaluate ten attribute which are grouped into five categories namely loyalty, perceived quality, associations, awareness, and market behaviour. This model helps the manager to measure the impact of each one on the brand equity. (J. L. Aaker, Aug1997) J. L. Aaker, construct a theoretical framework of the "Big Five" dimensions of brand personality (Sincerity, Excitement, Competence, Sophistication and Ruggedness). To measure the five brand personality dimensions, a reliable, valid and generalizable measurement scale is created. Finally theoretical and practical implications regarding the symbolic use of brands are discussed.

(Boonghee Yoo, Naveen Donthu, & Sungho Lee, April 2000) Explores the relationships between selected marketing mix elements and brand equity. They proposed a conceptual framework which states the relationship between marketing elements and brand equity dimensions. Used structural equation model support their

research hypotheses. Outcome of the study is frequent price

promotions, such as price deals, are related to low brand equity, whereas high advertising spending, high price, good store image, and high distribution intensity are related to high brand equity. (Yoo & Donthu, 2001) A multistep study is developed to validate a multidimensional consumer-based brand equity scale (MBE) drawn from Aaker's and Keller's conceptualizations of brand equity. A total of 1530 American, Korean American, and Korean participants evaluated 12 brands from three product categories (athletic shoes, film for cameras, and color television sets). Multistep psychometric tests demonstrate that the new brand equity scale is reliable, valid, parsimonious, and generalizable across several cultures and product categories. The authors discuss theoretical and practical implications of the study.

(Ailawad, Lehmann, & Neslin, 0ct2003) The authors recommend that the revenue premium a brand generates is a simple, objective, and managerially useful product-market measure of brand equity. A conceptual basis for measuring & computing brand equity for brands in several packaged goods categories is developed and tested its validity. Results reflect real changes in brand health over time. It correlates well with other equity measures, and the measure's association with a brand's advertising and promotion activity, price sensitivity, and perceived category risk is consistent with theory.

(Netemeyer et al. 2004) Presents four studies that develop measures of "core/primary" facets of customer- based brand equity (CBBE). Drawing from various CBBE frameworks, the facets chosen are perceived quality (PQ), perceived value for the cost (PVC), uniqueness, and the willingness to pay a

price premium for a brand. Using numerous advocated scale developmental procedures, the measures of these facets showed evidence of internal consistency and validity over 16 different brands in six product categories. Results also suggest that PQ, PVC, and brand uniqueness are potential direct antecedents of the willingness to pay a price premium for a brand, and that willingness to pay a price premium is a potential direct antecedent of brand purchase behavior.

(Atilgan, Aksoy, & Akinci, 2005) this article examine the practicality and application of a customer-based brand

equity model, based on Aaker's brand equity framework. Authors used structural equation modelling to analyse the cause & effect relationships between brand equity dimensions & brand equity itself. Respondents for the study were Turkey university students. Outcome is brand loyalty is most dominant dimension & least dominant is brand awareness and perceived quality. (Chattopadhyay, Shivani, & Krishnan, 2008) Reviews the various approaches to define and Measure Brand Equity. Paper justifies the interest of establishing a formal system to measure CRM performance. Analyzed attributes of Brand equity measurement. Classified measures of brand equity into three categories one set of measures focus on outcome of Brand Equity at the product market level, the second category related to customer mindset and the third set is based on measurement of financial parameters. It analyse the merits and limitations of the different types of measures.

(Afsar, Rehman, Qureshi, & Shahjehan, 2010) The study investigates the determinants of brand loyalty. Data analysis is done by collecting response

from 316 respondents. The study infers that Perceived quality, satisfaction, trust, switching cost and commitment each individually as well as jointly influence the loyalty of the customers.

(Anderson, spring2011) Anderson says that brand is a perpetual firm asset. Brand equity is defined as the financial value that a firm derives from customer response to the marketing of a brand. So brand perpetual value is developed as a financial measure of brand equity, where brand perpetual value is calculated as the value of perpetuity.

(Saleem & Abideen, 2011) This paper interrogate the relationship between independent variables which is environmental response and emotional response with attitudinal and behavioural aspect of consumer buying behaviour, by tapping the responses of 200 respondents using telecommunication services from Rawalpindi, Islamabad, and Lahore (cities of Pakistan). The major findings of the study demonstrate an overall normal association between the variables but in-depth analysis found that emotional response of consumer purchase behavior is the variable that results into strong association with the consumer buying behavior. It is true that people purchase those brands with which they are emotionally attached.

(Chu, Lee, & Chao, 2012) Author proposed a model to examine the relationships between service quality, customer satisfaction in, customer trust of, & loyalty to Taiwanese e-banks. 442 respondents who had experience with E- Banking were included in the study & data analysed using partial least squares structural equation modelling. It is found that e-banks must focus on service quality to increase customer satisfaction & trust to obtain customer loyalty.

(Abad, Ghadir, & Hossein, 2013) Aimed to conceptualize the customer based brand equity in the financial service sector with respect to its effect on perception of brand. Sample of 384 customers taken to test the relationship which is depicted in the proposed model of the study. Outcome of the study is perceived quality, brand loyalty, brand awareness and brand association are influential criteria of brand equity that enhances perception of brand in financial service sector. Brand association have most influence than other elements on brand equity. (Loureiro, 2013) Examines the interrelationships of trust, brand awareness/associations, perceived quality and brand loyalty in building Internet banking brand equity. The respondents were online banking user and data analysed using partial least squares (PLS) which employs a component-based approach for purposes of estimation and can readily handle formative factors. The results suggest that perceived quality and brand loyalty are more important to explain the Internet banking brand equity than brand awareness/associations and trust. Trust contributes only indirectly, through perceived quality and brand awareness/association to Internet banking brand equity. Online perceived benefits impact positively on customers trust and online perceived risks tend to be lower when trust increase. (Moghaddam, 2014) Study Pays attention to the role of quality of services in promotion of brand equity and ultimately customer's preference to the company's brand. 397 individuals were selected from the customers of the 5 elite banks of Tehran. For data analysis, the structural equation modelling (SEM), and confirmatory factor analysis (CFA)

and the software packages of SPSS and LISREL were used. The results indicate that the factors of services quality and perceived value have significant impact on brand equity and brand equity has a significant impact on brand preference and purchase intention and finally, brand

preference has a significant impact on customers' purchase intention.

(Sirisha, 2014) The study analyse the literatures related to brand equity & understand the different dimensions of the customer-based brand equity has referred by different researchers over a period. Develop a conceptual framework for measuring customer based brand equity.

(Dib & Alhaddad, 2014) Author analyzed hierarchical relationship between the brand equity dimensions such as brand awareness, brand trust, perceived quality and brand loyalty from the student perspective. 369 students from the higher institute of business administration (HIBA) were analysed using structural equations. The outcome is perceived quality does not have a significant influence on both brand trust and brand equity and on other hand, the rest of relationship between brand equity dimensions and brand equity is confirmed.

(Far, Rezaei, & Sadat, August 2015) Aimed at investigating affective factors (service experience, brand affinity and customer satisfaction) on building brand equity in banking industry of Iran. Research conducted taking 220 samples & using structural Equation Modelling. Service experience, brand affinity as the independent variables, and customer satisfaction as mediator variable, had an effect on building brand equity.

(D. S. Arora & Naagar, April 2016) Study is about those factors which determine the strong customer based

brand equity in the banking industry. A structured questionnaire is used to collect data from 120 respondents from selected Public Sector banks and Private Sector banks. The results produced six factors i.e. Brand investments, Brand performance, Brand salience, Brand verdict, Brand feelings and Brand unfamiliarity accounted for 73 percent variance. The findings revealed that out of the six factors extracted from the study, Brand verdict emerged as the most significant factor that leads to the determination of customer based brand equity.

(Rahi, Ghani, & Alnaser, 2017) Objective of the research is to measure the E-customer service which is the core dimension of e-service quality with internet banking adoption and Brand loyalty of Banks. In addition to this Customer perceived value has also been explored within internet banking context. A self-administered survey is conducted to approach 500 internet banking users in major cities of Pakistan. The data is analyzed through correlation and structural equation model (SEM) by using AMOS. Findings reveal that e- customer service and

perceived value significantly influence on internet banking adoption and brand loyalty of Banks.

(Chekalina, Fuchs, & Lexhagen, 2018) author applied CBBE concept to tourism destination. Study considered five dependent constructs and destination resources, value in use & value for money.

(Algharabat, Rana, Alalwan, Baabdullah, & Gupta, 2019) authors analysed attributes of CBE such as consumer involvement, consumer participation and self-expressive brand and its association between the determinants of CBBE namely brand

loyalty, brand awareness, perceived quality. (Iglesias, Markovic, & Rialp, 2019) study investigate how employee empathy effect sensory brand experience on brand equity through customer satisfaction and customer affective commitment.

Research overview on Brand Equity & its determinants

Keller (1993)	The space your brand occupies in customers mind	Brand salience Brand meaning Brand response Brand relationship
Lassar, Mittal, & Sharma, 1995)	Prices reflect the equity associated with the brand.	Performance social image price/value trustworthiness and identification/attachment
Aaker (1996)	Brand Equity is differential value added to both firm & customer	Brand loyalty Brand name awareness Brand associations Perceived quality Other proprietary brand assets
(Boonghee Yoo, Naveen Donthu, & Sungho Lee, April 2000)	Explores the relationships between selected marketing mix elements and brand equity.	Frequent price promotions, such as price deals, are related to low brand equity, whereas high advertising spending, high price, good store image, and high distribution

		intensity are related to high brand equity.
(Yoo & Donthu, 2001)	Developed multidimensional consumer-based brand equity scale (MBE) drawn from both Aaker's and Keller's conceptualizations of brand equity	
(Ailawad et al., 0ct2003)	The revenue premium a brand generates is a simple, objective, and managerially useful product-market measure of brand equity	
(Netemeyer et al. 2004)	Willingness to pay a price premium for a brand	perceived quality (PQ), perceived value for the cost (PVC), uniqueness, and the willingness to pay a price premium for a brand
(Chattopadhyay et al., 2008)	Establish Brand equity measurement based on 3 aspects such as product	Product/Market Customer Financial

	market level, customer level & financial measures	
(Afsar et al., 2010)	Brand equity in terms of brand loyalty	Perceived quality satisfaction trust switching cost and commitment
(Anderson, spring2011)	Financial value that a firm derives from customer response to the marketing of a brand	brand perpetual value is calculated as the value of perpetuity
(Saleem & Abideen, 2011)	Brand equity analyzed using environmental response and emotional response with attitudinal and behavioral aspect of consumer buying behavior	
(D. S. Arora & Naagar, April 2016).		Brand investments, Brand performance, Brand salience, Brand verdict, Brand feelings and
		Brand unfamiliarity
(Iglesias, Markovic, & Rialp, 2019	Employee empathy effect sensory brand experience on brand equity through customer satisfaction and customer affective commitment.	Sensory Brand experience Customer satisfaction Customer Affective Commitment
(Algharabat, Rana, Alalwan, Baabdullah, & Gupta, 2019)	Attributes of CBE and its association between the determinants of CBBE namely	consumer involvement, consumer participation self-expressive brand brand loyalty, brand awareness, Perceived quality.

VI Conclusion

Branding is most stimulating topics among both academicians & industry, since its introduction till today lot of research is done on this marketing concept. Even in a in the market and what has to be done to command high equity in the market. Conceptual study provides better insights about brand equity models & helps to identify various brand equity determinants & their relationship. Also it provides necessary framework to construct our own model & test their hypothesis in our market. It is also noticed that conceptualization of brand equity model developed by both Aaker & Keller holds good even today irrespective of the product /service & markets with little variation in the attributes of brand equity element.

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Performance, Combustion and Emission Characteristics of Diesel Engine Fueled With Jatropha/Diesel Blend

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ABSTRACT

In this study the role of performance and emission characteristic of single cylinder four stroke compression ignition engine have been investigated with different biodiesel blends at various ratios of jatropha oil and diesel.This experiment were conducted at injection timing 23˚BTDC and the injection pressures are 210 bar respectively with blends D90J10, D80J20, D70J30. In this investigation the various performances such as brake thermal efficiency, specific fuel consumption and exhaust gas emissions of CO, HC, NO_X and smoke are analyzed and compared with neat ULSD and jatropha. The investigation were carried out using an experimental set-up consisting of a single-cylinder diesel engine coupled with AVL gas analyzer and the exhaust gas details were observed by smoke meter and the performance, combustion and emission characteristics were analyzed for the test blends. Experimental results indicated that, HC, CO, smoke emissions are reduced and NOX emissions are higher when compared to neat ULSD. BSFC is increased and Brake Thermal Efficiency (BTE) is lesser than ULSD and D80J20 has the best efficiency among the test blends. Comparing emission results, D70J30 has the lowest CO and HC emissions and D90J10 has lower NOX emissions which is still higher than the ULSD and also has the lowest smoke opacity.

Keywords : Diesel engine, Bio-Diesel, Jatropha oil, Performance and Emission

I. INTRODUCTION

Diesel engine plays a vital role in power generation, transportation and industrial activities. The main advantages of the diesel engine over the gasoline spark ignition engine include its durability, reduced fuel consumption and lower emission of carbon monoxide and unburned hydrocarbon. Due to higher efficiency diesel engines are of high interest in light duty vehicles. India stands 4th in the world of oil consuming countries with an oil utilization of 3,182,000 barrels per day from its 70% used as the form of diesel and its pollution problem appeared many years ago. Diesel engines cause higher emission of particulate matter (PM), carbon monoxide (CO), Hydrocarbon (HC) and nitric oxides (NOX) causing various global hazards such as climatic Change, ozone layer depletion, green house effect, global warming, and smog acid rain water bodies and reduce in air quality. Due to the increased hazardous effects of emission from engine to reduce these effects many researchers have contributed their work by different ways like engine modification, fuel alteration, exhaust gas treatment etc.,[2]

In this way we operate engines with biodiesels alternative fuel at different injection timing and injection pressure without modification of previous engines. It is commonly accepted that there is some advancement of injection time when biodiesel is used in place of diesel because of its bulk density. The higher bulk density and viscosity transfers the pressure wave through fuel pipe lines faster and an earlier needle lift will lead to advanced injection. Due to the difference in cetane number, it is often

suggested that injection timing be retarded to attain more complete combustion of vegetable oil based fuels and also Fuel injection pressure in diesel engine plays an important role in engine performance. Higher injection pressure decreases fuel particle diameter which aids in better formation of mixing of fuel to air during ignition period, as a result of which engine performance will increase. High-pressure injection in combination with small orifice can achieve lean combustion which allows better fuel atomization, evaporation and improved emissions. High injection pressure also reduces soot emissions.[4]

A. C.I Engine

In compression ignition engines air is compressed in to the engine cylinder. Due to this the temperature of the compressed air rises to 700-900ºC. At this stage diesel is sprayed in to the cylinder in fine particles. Due to a very high temperature, the fuel gets ignited. This type of combustion is called constant pressure combustion because the pressure inside the cylinder is almost constant when combustion is taking place.

B. Fuel injection pressure

The performance and emission characteristics of diesel engines depends on various factors like fuel quantity injected, fuel injection timing, fuel injection pressure, shape of combustion chamber, position and size of injection nozzle hole, fuel spray pattern, air swirl etc. The fuel injection system in a direct injection diesel engine is to achieve a high degree of atomization for better penetration of fuel in order to utilize the full air charge and to promote the evaporation in a very short time and to achieve higher combustion efficiency. The fuel injection pressure in a standard diesel engine is in the range of

2000 to 1700 rpm depending on the engine size and type of combustion system employed. The fuel penetration distance become longer and the mixture formation of the fuel and air was improved when the combustion duration became shorter as the injection pressure became higher. When fuel injection pressure is low, fuel particle diameters will enlarge and ignition delay period during the combustion will increase. This situation leads to inefficient combustion in the engine and causes the increase in NOx, CO emissions.

C. Need of alternative fuel and types

The main reason for alternative fuel is that the consumption and demand of petroleum products are increasing every year due to urbanization, increase in vehicular density and power requirement is going up and to reduce emission produced by today's diesel engine, which in turns require a clean burning fuel that perform well under the variety of operating conditions. Alternative fuels are derived from resources other than petroleum and blended with petroleum products. Some are produced domestically, reducing our dependence on imported oil, and some are derived from renewable sources. Often, they produce less pollution than gasoline or diesel. Some of the alternative fuels are Ethanol, Biodiesel gas, Hydrogen and Electricity etc., Due to the increase the use of fossil fuels and the demand of its fuel resources the cost also increased because of this reasons its need to find out the another fuel source with low cost, less emission and with better performance its named alternative fuel.

D. Biodiesel

Biodiesel is a fuel equivalent of petro diesel with the exception of its derivation from biological sources. Both non-toxic and renewable, biodiesel essentially comes from plants and animals. A fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal. The major source of biodiesel is soybean oil, but other oils include rapeseed, canola, palm, cottonseed, sunflower, and peanut. All of which can be replenished through farming and recycling. Biodiesel can even be made from recycled cooking grease although biodiesel can be used in its pure form, it is usually blended with standard diesel fuel. Blends are indicated by the abbreviation Bxx, where xx is the percentage of biodiesel in the mixture. Much attention has been focused on the thought of it one day replacing fossil fuels as the world's primary transport energy source. Biodiesel is safe and can be used in diesel engines with few or no modifications needed.

E. Raw materials for biodiesel production

The second choice is making biodiesel using straight vegetable oil, or SVO. To do this, one would have to take a single-tank SVO system, replace the injectors and glow plugs, and add fuel heating. A two tank SVO system can also be used, which allows the oil to pre-heat and become thinner. With this system, the vehicle starts and stops using regular diesel and then switches to the SVO when it is hot enough. The third choice is to convert used cooking grease. Used cooking grease can be acquired through a local restaurant for free and put into a processing system. The grease is put into a cleansing unit, which heats the grease and separates the waste from the oil. Once

the grease is cleaned, certain chemicals must be added in order to finalize the biodiesel process.

F. Jatropha

Jatropha is a shrub that adapts well to arid environments. Jatropha curcas is the most known variety; it requires little water or additional care, therefore, it is adequate for warm regions with little fertility. Productivity may be reduced by irregular rainfall or strong winds during the flowering season. Yield depends on climate, soil, rainfall and treatment during sowing and harvesting. Jatropha plants become productive after 3 or 4 years, and their lifespan is about 50 years. Oil yield depends on the method of extraction, it is 28–32% using presses and upto 52% by solvent extraction. Since the seeds are toxic, jatropha oil is nonedible. The toxicity is due to the presence of curcasin a globulin and jatrophic acid as toxic as ricin.

G. Separation of the reaction products

The separation of reaction products takes place by decantation. The mixture of fatty acids methyl esters (FAME) separates from glycerin forming two phases, since they have different densities; the two phases begin to form immediately after the stirring of the mixture is stopped. Due to their different chemical affinities, most of the catalyst and excess alcohol will concentrate in the lower phase (glycerin), while most of the mono, di, and triglycerides will concentrate in the upper phase (FAME). Once the inter phase is clearly and completely defined, the two phases may be physically separated. It must be noted that if decantation takes place due to the action of gravity alone, it will take several hours to complete. This constitutes a bottleneck in the production process, and in consequence the exit stream from the transesterification reactor is split into several containers. Centrifugation is a faster, albeit more expensive alternative. After the separation of glycerin, the FAME mixture contains impurities such as remnants of alcohol, catalyst and mono, di, and triglycerides. These impurities confer undesirable characteristics to FAME, for instance, increased cloud point and pour point, lower flash point, etc. In consequence a purification process is necessary for the final product to comply with standards. This will be discussed in the next section.

H. Purification of the reaction products

The mixture of fatty acids methyl esters (FAME) obtained from the transesterification reaction must be purified in order to comply with established quality standards for biodiesel. Therefore, FAME must be washed, neutralized and dried. Successive washing steps with water remove the remains of methanol, catalyst and glycerin, since these contaminants are water-soluble. Care must be taken to avoid the formation of emulsions during the washing steps, since they would reduce the efficiency of the process. The first washing step is carried out with acidified water, to neutralize the mixture of esters. Then, two additional washing steps are made with water only. Finally the traces of water must be eliminated by a drying step. After drying, the purified product is ready for characterization as biodiesel according to international standards. An alternative to the purification process described above is the use of ion exchange resins or silicates. Glycerin as obtained from the chemical reaction is not of high quality and has no commercial value.

Therefore, it must be purified after the phase separation. This is not economically viable in small scale production, due to the small glycerin yield. However, purification is a very interesting alternative for large scale production plants, since, in addition to the high quality glycerin, part of the methanol is recovered for reutilization in the transesterification reaction both from FAME and glycerin, and thus lowering biodiesel production costs. The steady increase of biodiesel production is fostering research for novel uses of glycerin in the production of high-value- added products. It must be noted that the stages of the biodiesel production process are the same for the entire production scales laboratory, pilot plant, small, medium, and large scale industrial. However, the necessary equipment will be significantly different.[8]

Saurabh Singh Experimented on Use of Biodiesel in CI Engines at the experiment he says Vegetable oils are a suitable alternative to diesel in compression ignition (CI) engines. The use of vegetable oils in a C I engine results in low CO, HC and smoke opacity emissions compared to a conventional diesel fuel. Biodiesel, a clean renewable fuel, has recently been considered as the best substitute for a diesel fuel because it can be used in any CI engine without the need for modification. Chemically, biodiesel is a mixture of methyl esters with long chain fatty acids and is typically made from non-toxic, biodiesel resources such as vegetable oils (Jatropha, Karanja, Thumba etc.), animal fats or even waste cooking oils (WCO). Biodiesel processing is required to refine the vegetable oil feedstock and convert it into biodiesel, so as to meet the desired C I engines fuels specifications. This paper describes the basic processing required for the vegetable oil feedstock to make it usable in C I engines.[1]

Hemanandh.J analyzed the experiment on Diesel Engine Blended with Refined Vegetable Oil, In the scenario of fossil fuels and in ever depleting, there is always a scope for alternative fuels and this paper aims to study blends of diesel with Refined corn oil (BRC) on a stationery engine. The experiment is done on krisloskar direct injection 4 stroke diesel engine, single cylinder, air cooled 4.4 kW constant speed at 1500 rpm with an compression ratio 17.5:1. Methyl esters of BRC were transesterified with sodium meth oxide before blending with diesel. For different blends at diesel (10%, 30%, 40%) in volume at specific injection pressures (180bar, 210 bar and 240bar) against different loads (0%, 25%, 50%, 75%, and 100%) have been tried in the experiment to study NOx, CO, HC, Smoke emissions with exhaust temperature. A 3- hole nozzle has been used and the emission are analyzed with AVL gas analyzer.Even though marginal increase in NOx with exhaust temperature at higher temperature are noticed the decrease in engine temperature by 3 deg in addition to HC and CO an significant. He conclude the higher pressure plays a crucial reduction of emissions as in 240 bar with 40% diesel. The NOx emission is generally less for lower percentage of blends with lower pressures and at higher pressure the emission of NOx increases. Biodiesel smoke opacity is marginally high when compared with diesel. Engine temperature increases during the lower loads and it decreases against higher loads.[3]

Sungyong Park investigated on Emission characteristics of exhaust gases and nanoparticles from a diesel engine with biodiesel-diesel blended fuel (BD20) in that journal he explained obout the study sought to investigate the characteristics of the exhaust emissions, and nanoparticle size distribution of particulate matter (PM) emitted from diesel engines fueled with 20% biodiesel-diesel blended fuel (BD20). The study also investigated the conversion efficiency of the warm-up catalytic converter (WCC). The emission characteristics of HC, CO, NOx and nano-sized PM were also observed according to engine operating conditions with and without exhaust gas recirculation (EGR). The study revealed that the maximum torque achievable with the biodiesel diesel blended fuel was slightly lower than that achievable with neat diesel fuel at high-load conditions. Smoke was decreased by more than 20% in all 13 modes. While the CO and THC emissions of BD20 slightly decreased, the NO emission of BD20 increased by 3.7%. Measured using the scanning mobility particle sizer (SMPS), the total number and total mass of the nanoparticles in the size range between 10.6nm and 385nm were reduced by about 10% and 25%, respectively, when going from D100 to BD20. The particle number and mass for both fuels were reduced by about 43% when going from with EGR to without EGR. When EGR was applied in the engine system, the particle number and mass were reduced by 24%, and 16%, respectively, when going from D100 to BD20.[5]

S.Jindal epeimented on Effect of injection timing on combustion and performance of a direct injection diesel engine running on Jatropha methyl ester. He said the fuel properties of biodiesel are comparable with that of diesel and lower blends with diesel are found suitable even for long term uses. Higher blends are still away from acceptance due to poor performance, mainly due to the reason that, the present age engines are the result of extensive research keeping petro diesel only as fuel in mind. Biodiesel being a fuel of different origin and quality, the engine design needs revision and different settings for optimum performance. As the combustion advances with biodiesel due to early entry, retarding the injection timing by 3˚ is found to increase the thermal efficiency by 8% and reduce the specific fuel consumption by 9% when Jatropha methyl ester is used as fuel. Highest exhaust temperature and indicated power are obtained on 3˚ retarded injection. By retarding the injection, the fuel delivery is also reduced resulting in slightly lower pressure rise with peak shifting towards outward stroke reducing the negative work.[12]

II. METHODS AND MATERIAL

A Productivity of Jatropha depends on precipitation rates, soil moisture availability, soil characteristics. Annual yield levels at 2-3 tons dry seeds have been proposed as achievable in semi-arid areas and on wastelands, while 5 tons ha-1 can be obtained with good management on good soils receiving 900-1200 mm average annual rainfall. Jatropha has not yet undergone breeding programs with selection and improvement. The productivity varies greatly from plant to plant and environmental factors are reported to

have a dominating role over genetics in determining seed size, weight and oil content.[6]

A. Properties of jatropha oil

The switch from petroleum-based diesel compared to biodiesel has its advantages and disadvantages. There are changes in energy efficiency based on composition, changes in environmental impacts, and differences in cost between the two types of diesel.

TABLE I.

COMPARISON OF PROPERTIES DIESEL AND

JATROPHA OIL [6]

Sr. No	Parameter	Diesel	Jatropha. curcas oil
1	Energy content (MJ/kg)	42-46	38.2
2	Density (gm/cc), 30°C	0.836–0.850	0.93292
3	Kinematic viscosity (cSt), 30°C	4.2	55
4	Specific Weight (15/40 °C)	0.84-0.85	0.91-0.92
5	Solidifying point (°C)	-14.0	2.0
6	Flash point (°C)	80	180
7	Fire point (°C)	78	256
8	Pour point (°C)	-6	6
9	Ignition point (°C)	257	340
10	Cetane value	40-55	38-40
11	Sulphur (%) by Wt	1.0-1.2	0-0.13
12	Oxygen (%, w/w)	1.19	11.06
13	Carbon (%, w/w)	86.83	76.11
14	Hydrogen (%, w/w)	12.72	10.52
15	Ash Content (%, w/w)	0.01±0.0	0.03±0.0

B. Characteristics of jatropha oil

Non-edible oil generally contains about 3-4 %wax and gum. De-waxing and degumming of plant oils is required not only for smooth running of the CI engine but also to prevent engine failure even if plant oils are blended with diesel. It is therefore necessary to remove wax and gum from the fresh oil before it could be used in CI engine. Analysis of Jatropha seeds revealed that the percentage of crude protein, crude fat and moisture were 24.60, 47.25 and 5.54% respectively (Akintayo, 2004). Crude-

Jatropha oil, a non-edible vegetable oil shows a greater potential for replacing conventional diesel fuel quite effectively, as its properties are compatible to that of diesel fuel. It is however found from researches that the neat jatropha oil can be used to run the engines in mini-vans for rural transportation, haulage trucks, farm tractors and other agricultural machinery, but may require little modification. Density, cloud point and pour point of Jatropha oil are found to be higher than diesel. Higher cloud and pour point reflect unsuitability of Jatropha oil as diesel fuel in cold climatic conditions but the flash and fire points of Jatropha oil is very high compared to mineral diesel. Hence, Jatropha oil is extremely safe to handle . Higher carbon residue from Jatropha oil may possibly lead to higher carbon deposits in combustion chamber of the CI engine. Low sulphur content in Jatropha oil results in lower SOx emissions.

Presence of oxygen in fuel improves combustion properties and emissions but reduces the calorific value of the fuel. Jatropha oil has approximately 90% calorific value compared to diesel. Nitrogen content of the fuel also affects the NOX emissions. Higher viscosity is a major problem in using vegetable oil as fuel for diesel engines. Viscosity of Jatropha biodiesel is 4.84cSt at 40°C. It is observed that viscosity of Jatropha oil decreases remarkably with increasing temperature and it becomes close to diesel at temperature above 90°C.[7]

C. Advantages of the jatropha plant

· Low cost seeds.

· High oil content.

· Small development period.

- Grow on good and despoiled soil.
- Grow in low and high rainfall areas.
- Does not require any special maintenance.
- Can be harvested in non-rainy season.
- Size of the plant makes the collection of seeds convenient.
- Multi products are developed using a single jatropha plant. The products include bio-diesel, soap, mosquito repellent, and organic fertilizer.[9

D. Economics benefits

- Increase employment activity and increase Employment on the countryside
- Emits up to 100% less sulfur dioxide
- Reduces smoke particulates at about 75%

E. Schematic diagram

The experiment aims at determining appropriate proportions of biodiesel & diesel for which higher efficiency is obtainable. Hence, experiments are carried out at constant speed, comparing the performance of compression ignition engine operated on blends of diesel. The blend is checked under loads 0%, 25%, 50%, 75% and 100% with injection timing 23° by different injection pressure 210 bar.
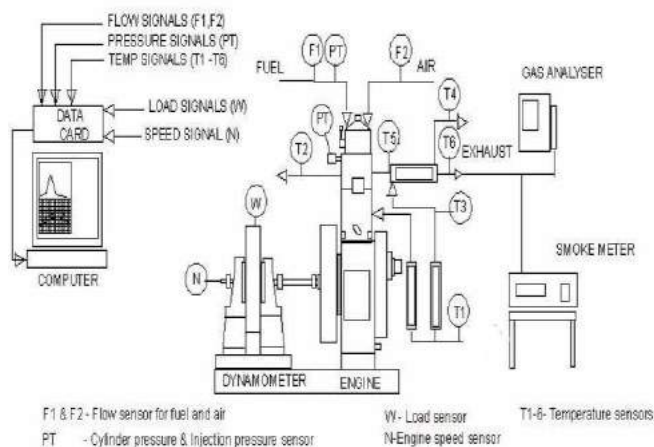
Figure 1. Schematic Diagram

The samples are prepared by using the 600 ml measuring jar. Figure shows the schematic diagram of the complete experimental setup for determining the effects of jatropha oil as bio diesel on the performance and emission characteristics of compression ignition engine.

F. Test engine and facilities

Tests were conducted in a 1-cylinder, constant-speed, 4-stroke, DI diesel engine. The existing population of this diesel engine driven pump-sets in India is about 14.42 million and more than a million and a half were added to this every year with a projected growth of 7%. This sector alone consumed 8.55% of India's total diesel consumption (69 MMT) in the year 2012–13 and this directly exposes a large population of farmers in India to its toxic diesel exhaust. Hence this engine is chosen for this study. The exhaust gas was passed through a cold trap and a filter element to separate moisture before entering the gas analyzer. HC emissions were measured in parts per million (ppm) of hexane (C6) equivalents while CO emissions were measured in terms of volume percentage. The effect of ambient temperature and humidity on NOx emissions should be accounted in order to compare engines across different locations at different atmospheric conditions.

TABLE II.

ENGINE SPECIFICATIONS

Make and model	Kirloskar, TV1 make
Number of cylinders	1

Combustion chamber	Hemispherical open type
Piston	Shallow Bowl-in type
Bore, mm	87.5
Stroke, mm	110
Connecting rod length, mm	234
Swept volume, cm3	661.45
Clearance volume, cm3	36.87
Compression ratio	17.5:1
Rated power, kW	5.2
Rated speed, rpm	1500
Injection type	Direct Injection
Number of Nozzle holes	3
Spray-hole diameter, mm	0.25
Injection pressure, bar	210
Injection timing, CA bTDC	23
Injection duration, CA	20–30
Cone angle,	110
Needle lift, mm	0.25

G. Experimental procedure

Initially the engine was run on no load condition and its speed was adjusted to 1500 ±10 rpm. The engine was then tested at no load and at 25, 50, 75 and 100 percent loads. For each load condition, the engine was run for at least three minutes after which data were collected. First the pure diesel was tested at the above loading conditions and the data are collected use of the data's the performance are calculated and the emissions are noted by gas analyzer. Then the blended biodiesel poured into the fuel reservoir and the biodiesel allowed into the engine after the engine was running for five three minutes with biodiesel as fuel at normal condition. After that the first set of data are noted at standard injection timing of diesel engine 23º BTDC at 210 bar injection pressure at the same condition the gas analyzer give exhaust emission data. With the help of collected information at different conditions and for other test blends the engine performance and emission characteristics are analyzed. The result and comparison is shown below at the form of graph.

III. RESULTS AND DISCUSSION

A The performance, combustion and emission characteristics of the engine fueled with Jatropha biodiesel blends were discussed with reference to baseline engine fueled with fossil diesel (ULSD) and operating under naturally aspirated conditions.

A. Performance analysis

Fig.2 illustrates the variation of BSFC and BTE with all engine loads for jatropha blends with ULSD as reference. Initially the BSFC decreases on increasing the load and BSFC is almost constant at peak conditions. At peak load J100 has highest BSFC compared to other test blends.At peak load conditions, all the test blends have more BSFC than ULSD. Since the density of the blends increases more energy is required for atomization and combustion, hence more fuel is consumed which influences the engine performance. BTE increases with increase in the load and diesel has the maximum BTE at peak

load condition and among the test blends D80J20 has higher BTE which is 1.1% less than the diesel.
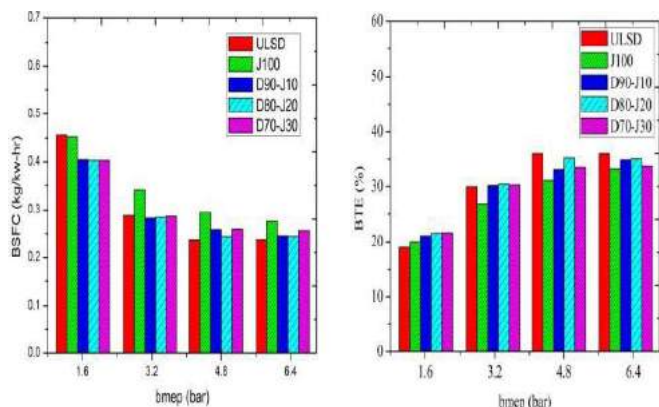
Figure 2. Performance analysis chart

B. Combustion analysis

Fig.3 represents the combustion data analysis with the variation of HRR and pressure in comparison with ULSD at rated power output of the engine. Since jatropha has low cetane number, it prolongs the ignition delay. The ignition delay causes more fuel to be burnt in the premixed combustion phase which increases the rate of pressure rise leading to faster burning rate and heat release rate(HRR). D90J10 has the highest HRR and D80J20 has the lowest among test blends. The heat release rate increases to a peak value and gradually decreases on increasing the crank angle.
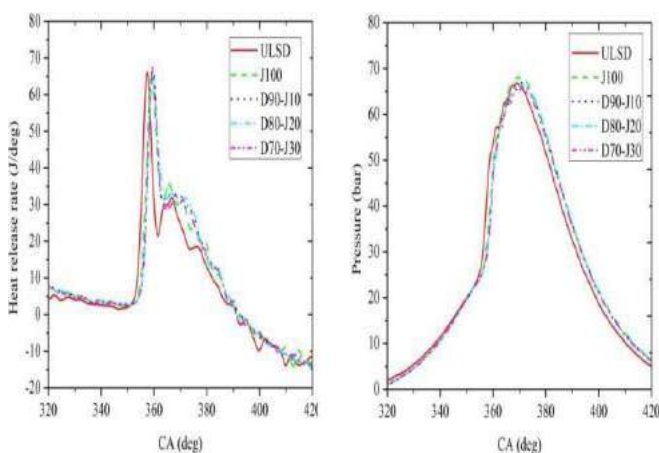
Figure 3. Combustion data analysis

From the analysis, J100 has the highest peak pressure and D70J30 has the lowest peak pressure. Longer combustion time increases the pressure hence J100 has maximum pressure.

C. Emission analysis
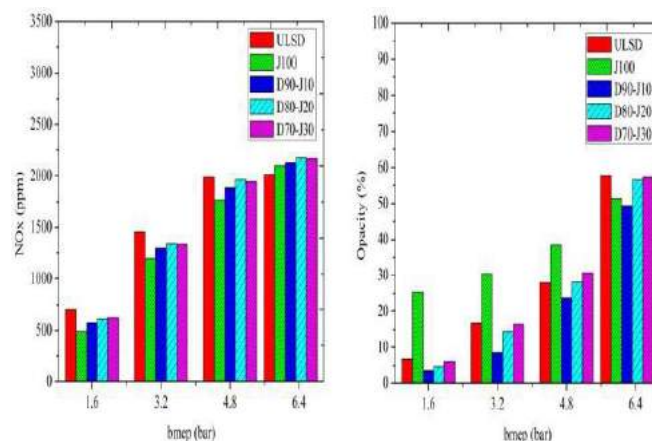
Figure 4 . NOx emissions and smoke opacity

The variation of NOx emission for jatropha blend with various engine loads are shown in Fig.4. NOx emissions increase with increase in the load conditions and at peak load, diesel has the lowest NOx and among the test blends J100 has the lowest NOx emission and D80J20 has the highest emission. This is due to the high nitrogen content in jatropha plant. At initial and medium loads, diesel has higher NOx emission than the other test blends. Smoke opacity levels increase with increase in the load characteristics. At initial and medium loads J100 has maximum smoke opacity. At peak load diesel has the maximum smoke opacity and D90J10 has the lowest smoke opacity at all load conditions. This is because jatropha has high carbon content and lower the jatropha ratio, lower the smoke opacity levels.
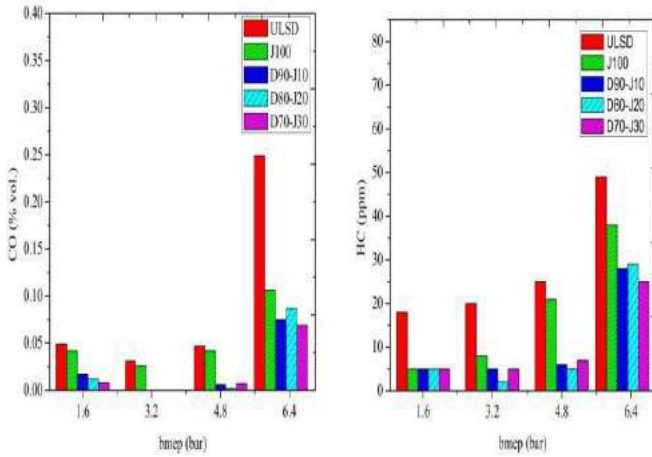
Figure 5. HC and CO emissions

The variation of CO emission under various loads conditions for jatropha blends are shown in Fig.5. The CO emission is low for test blends at initial loads and very low at medium loads. At peak load condition diesel ULSD has more CO emission and among the test blends D70J30 has the lowest CO emission which is 4 times less than the ULSD emission.Analyzing the HC emissions, HC emissions increase with increase in the load and at peak load ULSD has high emission. Comparing among the test blends J100 has the highest HC and D70J30 has the lowest. At initial and medium loads D80J20 has the minimum HC emission.

IV. CONCLUSION

In this project, load performance and emission tests were conducted and data were collected and compared. Engine function had been monitored and the combustion, performance and emission characteristics were analyzed and the following conclusions were made

- At all load conditions, D80J20 has low BSFC and J100 has the highest BSFC when compared to other blends.

- At all load conditions, D80J20 has higher efficiency among the test blends which is 1% less than the efficiency of ULSD.

- At peak load conditions, ULSD emits more CO and among the test blends D70J30 has the lowest emission which is nearly 4 times less than the ULSD.

- At peak load condition, D70J30 has lowest HC and ULSD has the highest HC emission.

- At peak load condition, D70J30 shows the highest NOx emission and ULSD has the lowest emission.

- At peak load condition, ULSD has highest smoke opacity and D90J10 has the lowest smoke opacity

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Optimization of An Aircraft's Fuselage Using Topology

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ABSTRACT

The main objective of this paper is to provide an optimum preliminary basic design for the central part of the fuselage structure using the topology optimization method and to check whether the design is safe or not. Several loading cases like the aerodynamic loads, structural loads etc were considered for the analysis. The central part of the fuselage was modeled using CATIA and it was analyzed using ANSYS software for different parameters like material properties, loads acting on the fuselage etc.. and even the topological parameters were applied. After the 1st analysis or the 1st iteration the model was imported back to CATIA and the regions of low stresses were removed and again analyzed and after subsequent analysis or iterations a fuselage structure with optimum material, lower stress acting regions, optimized structural volume and few other desirable objectives are obtained. Later the analysis is done to get an optimized shape and size of the fuselage.

Keywords : Topology Optimization, Optimized Material, Subsequent Analysis.

I. INTRODUCTION

Topology optimization is a mathematical method that optimizes material layout within a given design space, for a given set of loads, boundary conditions and constraints with the goal of maximizing the performance of the system. TO is different from shape optimization in the sense that the design can attain any shape within the design space, instead of dealing with predefined configurations.

It involves the optimal distribution of material within the structure. It is used to find a preliminary structural configuration that meets predefined criteria. This type of optimization sometimes gives a design that can be completely new and innovative. Typically, the design process starts with a block of material called the design domain. The design domain is comprised of large number of candidate elements, and topology optimization process selectively removes the unnecessary elements from the domain.

Topology optimization is used by engineers at the concept level of the design process to arrive at a design proposal that is then fine tuned for performance and manufacturability. This replaces time consuming and costly design iterations while improving design performance. In some cases, results from a topology optimization, although optimized, may be expensive or infeasible to manufacture. These challenges can be overcome through the use of manufacturing constraints in the problem formulation. Using manufacturing constraints, the method yields engineering designs that would satisfy practical manufacturing requirements. In some cases results from topology optimization can be directly manufactured using additive manufacturing.
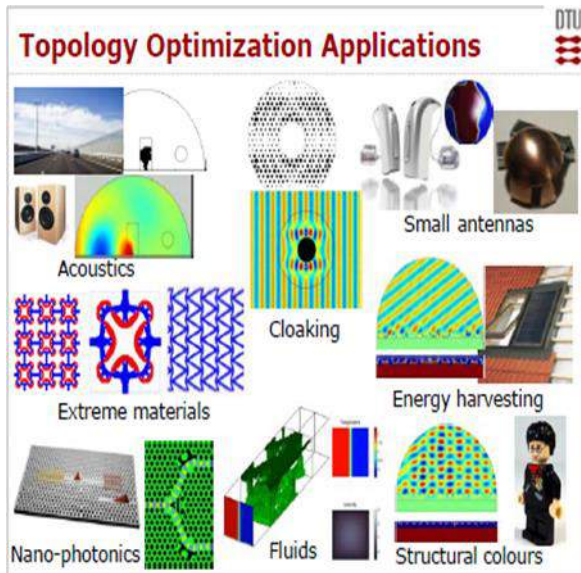
Fig. 1 Applications of Topology Optimization

II. PROBLEM DEFINITION OF THE PROJECT

1. Less resistance of the fuselage structure to withstand the loads acting on it.

2. Low stiffness of the fuselage which deforms quickly.

3. High volume of the fuselage structure which results in the use of extra material.

4. Increase in overall cost of the material of the fuselage.

III. OBJECTIVE OF THE PROJECT

1. To optimize the fuselage shape for weight reduction, minimizing the use of the material for the fuselage.

2. To get a structure of the fuselage that satisfies all the design constraints with minimum material.

3. To get a highly efficient product.

4. To get a higher quality product with overall lower development cost.

5. To get a fuselage structure capable of withstanding any higher loads.

6. To minimize the volume of the structure.

7. To get a fuselage structure of minimum weight and higher stiffness.

IV. METHODOLOGY

Software used: CATIA software is used to model the fuselage and later ANSYS software is used for the analysis and optimization of the fuselage structure.

Parameters needed for the analysis:

1. Material of the fuselage: The material selected here for the analysis is aluminum alloy 7075 and the relevant material properties of AL 7075 can be used and the properties of the material are mentioned in the next chapter.

Material considered and the material properties: The material that was considered here was aluminum alloy 7075 and it was selected based on certain factors and was selected in ASME codes.

Factors considered for selecting the type of material:

· Young's modulus: A material with higher young's modulus was required because of its higher stiffness.

· Rigidity modulus: A material with higher rigidity modulus is required because of its resistance to shear loads.

· Density: A material with less density is always needed in aircraft applications because of its lower weight.

· Hardness: A material with higher hardness is required because of its resistance to surface indentation and cracks.

· Thermal resistance: A material with higher thermal resistance is required because at higher altitudes the temperature rises and the material may expand and that leads to failure, so if a material of higher thermal resistance is used the failure or the deformation of the material can be avoided.

So considering all these factors, according to ASME codes the aluminum alloy 7075 was selected which has got all the optimum material properties.

Material properties of aluminum alloy 7075:

· Density: 0.1015 lb/in³ or 2.81g/cc

· Ultimate tensile strength: 572 Mpa

· Tensile yield strength: 503 Mpa

· Modulus of elasticity: 71.3 Gpa

· Poisons ratio: 0.33

· Fatigue strength: 159 Mpa

· Shear modulus 26.9 Gpa

· Shear strength: 331 Mpa

2. Loads acting on the fuselage: The different loads that were considered were aerodynamic pressure loads, load due to self weight of the aircraft, shear load, bending moment load, loads due to the torque.

Loads considered and values of the different loads: the different loads that were considered to act on the fuselage are loads due to self weight, aerodynamic pressure loads acting as outside pressure loads and inner pressure loads, loads due to torque, loads due to bending moment and loads due to shear. The values and the calculation of the loads are mentioned below.

· Loads due to self weight: The self weight of the fuselage was considered as approximately 5 ton or 5000 kg and when converted to kilo Newton the value of the self weight was about 49.05 KN and it is considered to act on the lower part of the fuselage structure.

· Loads due to the aerodynamic pressure loads: The aerodynamic pressure loads acts as outside pressure and inner pressure forces on all the sides, i.e. on the upper and lower surfaces of the aircraft and also on the cross sectional areas and when it acts on the cross sections it will be different on the upper and lower cross sectional area as both the semi-circular cross sections are of different area.

· Inner pressure that was considered was atmospheric and the value was 101.325 Pascal and when converted to KN the values were same on the upper and lower inner surfaces of the fuselage and it changed on the cross sections. The inner pressure on the upper semi-circle was 997. 27 KN and on the lower semi-circle was 1124.47 KN and on the upper and lower surfaces it was 42.619 KN.

· Outside pressure force too was same on the upper and lower surfaces and varied on the cross sections and the values of the outside pressure on the upper and lower surfaces were 18.096 Kpa and

in KN the value was 761.2 KN. The outer pressure force on the upper semicircular cross section was 178.12 KN and on the lower semicircular cross section it was 200.83 KN.

· The calculation is shown here: Inside pressure force on the upper and lower surfaces = 101.325*42.0264 * 0.01 = 42.619 KN.

· On the upper semi circle cross sectional area the inner pressure force was 101.325* 9.8423 = 997.27 KN.

· On the lower semi circle cross sectional area the inner pressure force was 101.325*11.097 = 1124.47KN.

· On the upper semi circle cross sectional area the outer pressure force was 18.096 * 9.8426 = 178.12 KN.

· On the lower semi circle cross sectional area the outer pressure force was 18.096 * 11.097 = 200.83 KN.

· Load due to torque:
T = (τ * JP) / R
 = [(331*106) * 19.60] / 1.8795
 = 3451.76 * 106 N-m.

· Load due to bending moment:
Mb = (E*I)/R
 = (71.3*109*0.6126)/1.8795
 = 371.76 * 109 N-m.
· Shear load:
On the upper surface = 331* 106* 9.8423
 = 3257.8 * 106 N.
On the lower surface = 331* 106* 11.0977
 = 3673.34 * 106 N.

V. DESIGN OF FUSELAGE

Model of the fuselage: The Fuselage model that is considered here in the project is BOEING 707-120B. Dimensions of the fuselage:

- Length of the fuselage: 42.06 m (138 feet).
- Diameter of the upper semi circle: 3.54 m.
- Diameter of the lower semi circle: 3.759 m.
- Cross sectional area of upper part: 9.84 m2.
- Cross sectional area of lower part: 11.097 m2.

3D modeled view of the fuselage using CATIA
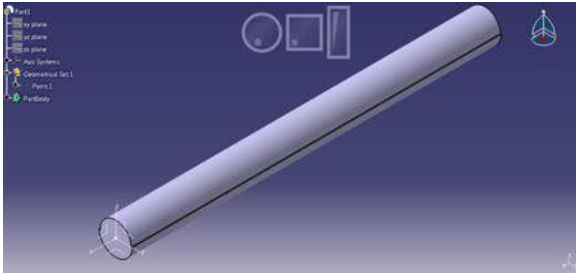
Fig. 2: 3D View in CATIA

Orthographic views of the fuselage structure
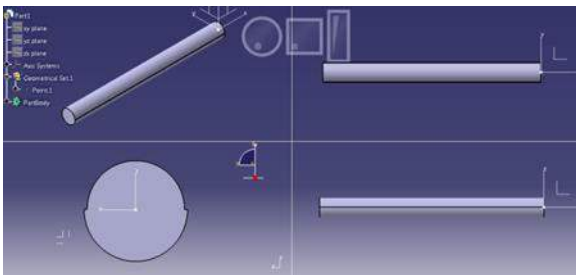
Fig: 3: Orthographic views of the fuselage

VI. RESULTS AND DISCUSSION

Meshing: The meshing results and also the results for one iteration for 1mm thickness of the fuselage are given below and subsequent iterations will be continued.
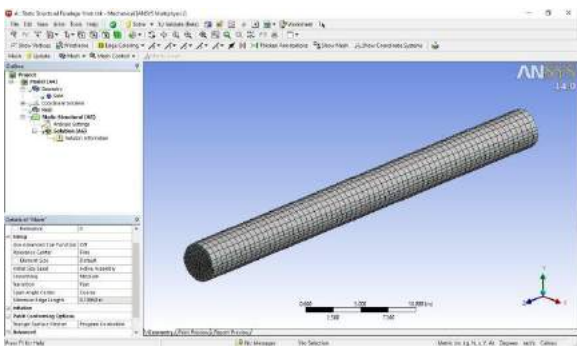
Fig: 4 mesh
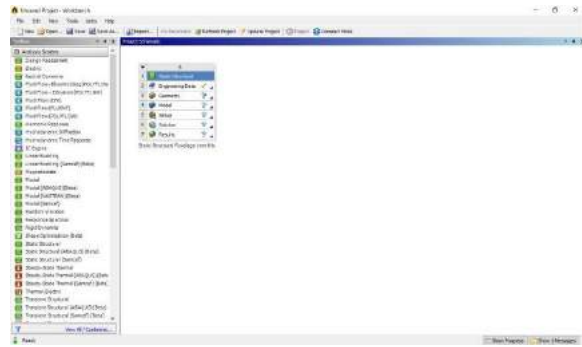
Fig. 5
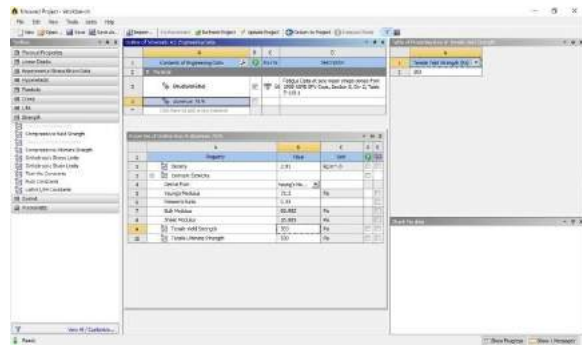
Fig: 6: material properties.
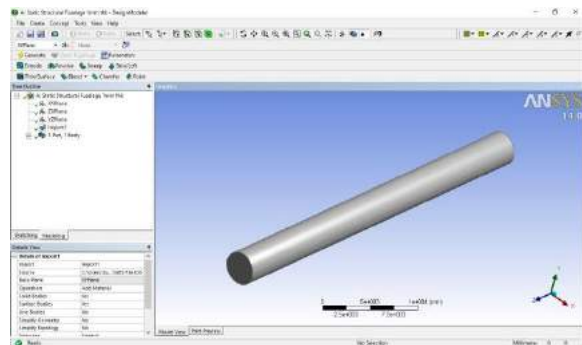
Fig: 7 Static fuselage 1mm thick.
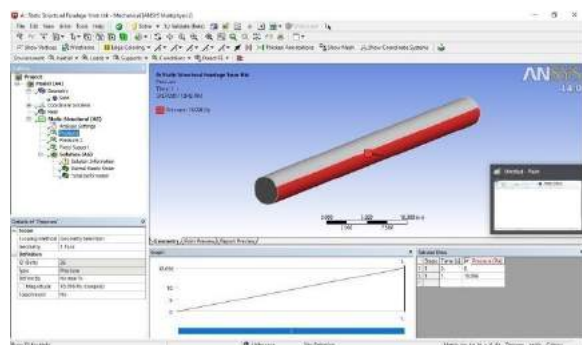
Fig: 8 Aerodynamic pressure loads.
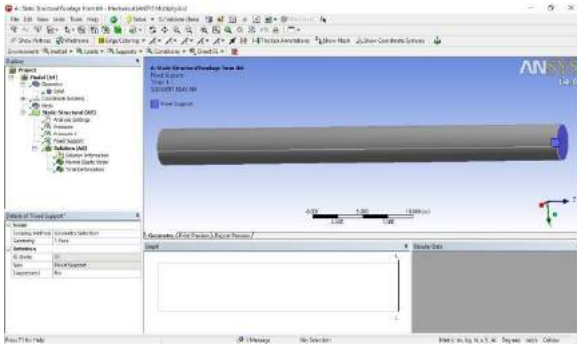
Fig: 9 constraints.
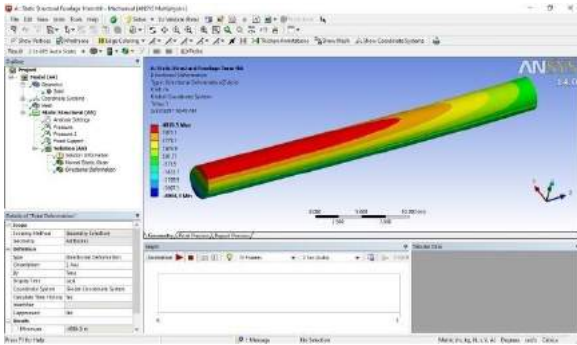
Fig: 10 deformation.
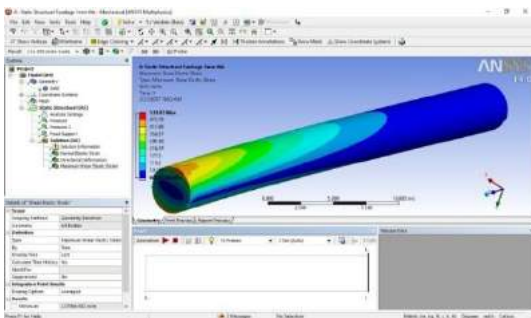
Fig. 11 Maximum Shear Strain

VII. CONCLUSION

The present project gives optimized results for the fuselage structure, first the analysis is carried out and the optimized regions of stress are determined and later the shape and size optimization is carried out and again a fuselage with an optimized size and shape is obtained.

VIII. FUTURE WORK

The present study focuses on only the central part of the fuselage but a future scope can be there where the entire aircraft can be optimized and even a

higher efficient structure and power output can be produced.

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Vibration Characteristics and Parametric Analysis of Inflatable Membranes

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ABSTRACT

This study presents the Dynamic Analysis of thin membranes with different parameters. Membranes are used in various fields like aerospace, medicine, etc. It is essential to study their vibration characteristics. Modal analysis of flat pre-stressed membranes is carried out using finite element analysis tool ANSYS and the results are compared with Theoretical Calculations. A Good match between the two solutions was observed. Furthermore, vibration analysis of membranes with varying parameters was carried out, the results are studied and significant conclusions are drawn.

Keywords: Mode shapes, Vibrations, Modal Analysis, Natural Frequency.

I. INTRODUCTION

A membrane is thin shell structure with no bending stiffness. Hence a membrane cannot resist any compression at all. However, membrane theory accounts for tension and compression stresses. In membrane theory only the in-plane stress resultants are taken into account. This study presents the modal analysis for predicting the behavior of various shaped thin membranes of various materials which are optimally subjected to pre-stress to render them to behave as structural members rather than bending or moments.

Membrane materials

Table1: Properties of membrane materials (Ruggiereo etal 2003, Srivastava et al 2008).

Sl no	Name of the Material	Mass Density [kg/m^3]	Young's Modulus [N/m^2]	Poisson's ratio
1	Kevlar	790	11.9×10^9	0.3
2	Kapton	1420	2.5×10^9	0.34
3	Mylar	1390	8.81×0^9	0.38
4	PVDF	1780	2.8×10^9	0.32

II. FREE VIBRATIONS OF RECTANGULAR MEMBRANES

A rectangular membrane with plane form dimensions a × b is shown in Figure. 1. Assume that uniform tension is applied to it in all directions, so that free vibrations are governed by the equation of motion. To determine the natural frequencies and mode shapes, we will proceed in the usual manner, that is, a solution to will first be found, and then the boundary conditions will be applied.
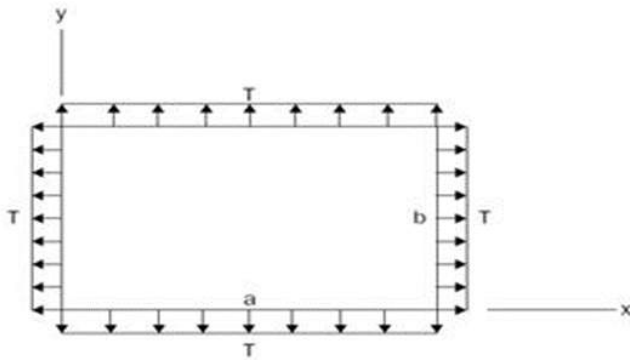
Figure: .1 Rectangular membrane subjected to equal tension in all directions.

Using the method of separation of variables, a solution to is assumed in the form

$$w(x, y,t) = X(x) * Y(y) * \Phi(t)$$

Substituting this into wave equation, and dividing by $XY\Phi$ results in

$$\frac{X''}{X} + \frac{Y''}{Y} = \left(\frac{\rho h}{T}\right)\frac{\Phi''}{\Phi}$$

Each of the three terms is a function of a different variable (x,y, or t), therefore, the only way in which this equation may be valid is if each term is equal to a constant. Let these constants be $-\alpha^2$, $-\beta^2$, and $-\gamma^2$. Then

$$X'' + \alpha^2 X = 0$$
$$Y'' + \beta^2 X = 0$$
$$\Phi'' + \left(\frac{T}{\rho h}\right)\gamma^2 \Phi = 0$$

And

$$\alpha^2 + \beta^2 = \gamma^2$$

In anticipation of the solution form, replace $(T/\rho h)\gamma^2$ by the constant ω^2, which will be, of course, the circular frequency. Solutions are then

$$X = A\sin\alpha x + B\cos\alpha x$$
$$Y = C\sin\beta y + D\cos\beta y$$
$$\Phi = E\sin\omega t + F\cos\omega t$$
where $\quad \alpha^2 + \beta^2 = \left(\frac{\rho h}{T}\right)\omega^2$

Boundary conditions where all edges are fixed will be considered.
The boundary conditions are therefore

$$w(0, y,t) = w(a, y,t) = w(x,0,t) = w(x,b,t) = 0$$

hence

$$X(0) = X(a) = Y(0) = Y(b) = 0$$

Substituting this into solution, gives B = D = 0 and In non-dimensional form,

$$\lambda = \omega a\sqrt{\frac{\rho h}{T}} = \pi\sqrt{m^2 + \left(\frac{a}{b}\right)^2 n^2} \qquad (m,n = 1, 2, 3, \ldots, \infty)$$

It is seen that the non-dimensional frequency parameter λ, depends on the aspect ratio (a/b) of the membrane and that, for any a/b, there is a doubly infinite set of frequencies depending on the choices of m and n. Different analytical methods can be used for membranes of different shapes.

III. RESULTS AND DISCUSSION

Modal analysis of membranes of various shapes L-shaped membrane (S.C. Gajbhiye, S.H. Upadhyaye and S.P.Harsha)

A. Dimensions and Parameters
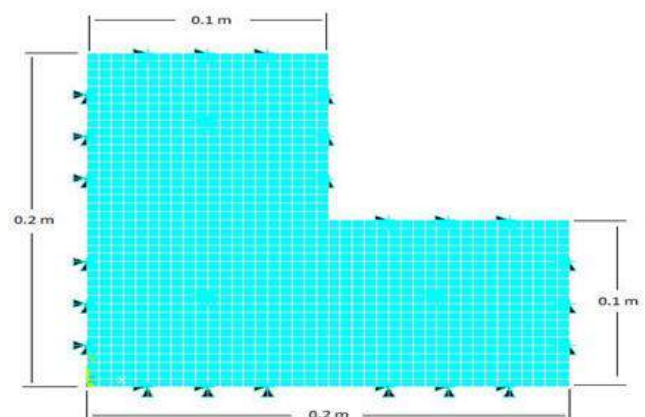
Young's Modulus : 11.9x109 N/m2
Poisson's ratio : 0.3
Thickness : 0.1 mm
Density: 790 kg/m3
Pre-stress Applied : 10 N/m2

No. of Elements   : 1600

Boundary Conditions : The Membrane is fixed on all the edges.

B. Mode Frequencies and Shapes

Table: 2 Natural frequencies of a L-shaped membrane

Mode No.	Natural Frequency (Hz)
1	54.210
2	67.610
3	75.682
4	90.057
5	91.584
6	108.150

Mode I   Mode II   Mode III

Mode IV   Mode V   Mode VI
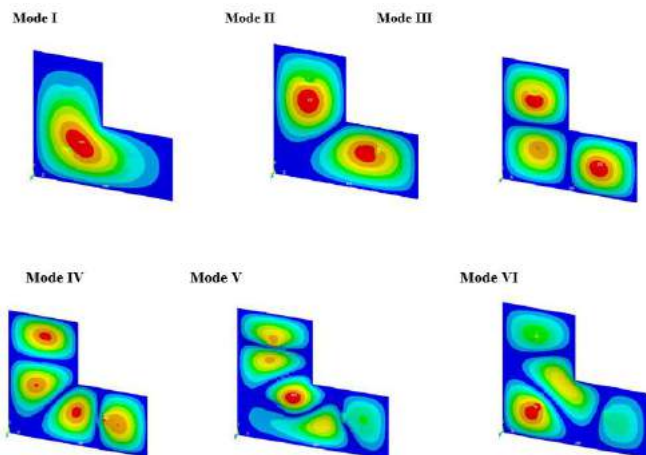
C. Elliptical Membrane

Dimensions and parameters

Major axis   : 1.5 m

Width : 1.0m

Thickness   : 0.1 mm

Young's Modulus   : 11.9x109 N/m2

Poisson's ratio : 0.3

Density: 790 kg/m3

Pre-stress Applied   : 10 N/m2

No. of Elements   : 1600

Boundary Conditions: The Membrane is fixed on all the edges.

Table: 3 Natural frequencies of an elliptical membrane

ModeL No.	Natural frequency in Hz (Ansys)
1	18.284
2	28.181
3	31.771
4	34.530
5	39.002
6	43.145

Mode I   Mode II   Mode III

Mode IV   Mode V   Mode VI
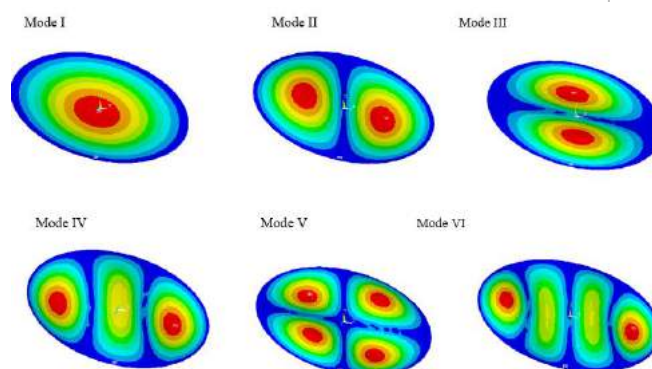
IV. CONCLUSIONS AND SCOPE FOR FUTURE WORK

The geometric modeling and Analysis of inflatable structures viz membranes was carried out and variation of natural frequencies and mode shapes with respect to varying parameters were shown. In future, the harmonic analysis can be carried out. More studies can be made for specific applications. Different FEA tools like ABAQUS can be used for more dynamic visualization of modes. Based on the present work the membrane structures can be designed for optimal vibrations. Also, studies can be taken up for varying temperature conditions like cryogenic temperatures and very high temperatures.

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Modification of Milling and Turning Tool Inserts Plant Layout in a Tool Manufacturing Company

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ABSTRACT

This work is pertaining to modification of milling and cutting tool inserts plant layout in Production Unit.. Extensive work has been carried out using value stream mapping (VSM) to identify the problems, bottlenecks, cycle time, down time, work-in-process inventory, material movement constraints, production flow lines etc in the existing system. Modification of present layout in PU5 leading to creation of separate layout for five operations of milling inserts manufacturing activity, addition of machines required, and reducing the job allocation time from 24 hours to 6 hours has resulted in a lot of improvements. Significant improvements are;

(i)   Lead time of milling inserts manufacturing is reduced from 14.092 days to 5.95 days and that of turning inserts is reduced from 12.392 days to 5.58 days. Percentage reduction in Lead time is 57.77% and 54.97% respectively.

(ii)   Work-in-process Inventory is reduced from 210550 units to 110600 units, reduction of 47.5 percent.

(iii)   Material handling distance is reduced from 315 meters to 265 meters. Value added percent for Turning Inserts is increased from 15.04 % to 45.02% and for milling inserts from 13.012 % to 42.02%.

(iv)   Centralization of coolant supply system resulted better space utilization and flexibility in effecting changes in machines locations.

(v)   With the new overhead electric connections, the power line can be dropped down and used by the required machines and the need to re-wire and re-do the entire electric connection for layout changes is eliminated.

Based on the study and in consultation with company executives the present Mixed-flow line is converted into **Mixed-flow line zone To Parallel dedicated flow lines zone To Mixed-flow line zone** in two plants.This resulted in development of separate reconfigured layout.

Keywords: Value Stream Mapping, Lead Time, WIP Inventory, Flow Line

I. INTRODUCTION

Success of the manufacturing industry is largely determined by its ability to respond rapidly to market changes and to immediately adjust to customer demand. This has resulted in an increasing demand for deployment of systems that can cope with agility and efficiency. Companies must respond with modifying production processes. It has been studied by several authors that, in order to respond to customer´s requirements [1].

VSM has been defined as a powerful tool that not only highlights process inefficiencies, transactional and communication mismatches but also provides inputs and guides for improvement /modification of manufacturing layouts. This tool is proved to be successful in different applications under different environments and contexts.

Large manufacturing organizations have been achieving productivity improvements for decades using what is commonly known as lean production. Less is known about the extent to which small and medium sized firms have benefitted from adoption of lean practices such as VSM. This tool helps in tracing out system constraints and overcome them by implementing new proposals in production units [2].

VSM is a method of visually mapping the flow of materials and information from the time. The product comes in as the raw material, moves through all the manufacturing process steps and off the loading dock as finished product. Mapping out the activities in the in the production process with the cycle times, down times, work-in-process inventory,

material movement, information flow paths, will help to visualize the current state of the activities and guide towards the future desirable state. When all the possible improvements have been identified and considered in VSM, the next stage is to develop a single, future state map to show how to operate the process in the future. The new process is tested against the Lean principles and any waste or flow issues are identified and removed [3].

II. EXISTING MANUFACTURING SYSTEM

In cutting tool inserts manufacturing company PU5 is engaged in the process of manufacturing turning and milling tool inserts, these inserts are mainly used for metal cutting. Cutting tool inserts are manufactured by adopting powder metallurgy process. Powder metallurgy uses sintering process for making various parts out of metal powder. The metal powder is compacted by placing in a closed metal cavity (die) under pressure. This compacted material is placed in an oven and sintered in a controlled atmosphere at high temperatures below the melting point of the main constituent for the purpose of increasing its strength by binding together of particles. Manufacturing steps after sintering are top and bottom grinding, periphery grinding, edge rounding, cleaning and blasting.

Most of the manufacturing procedure of milling and turning inserts is common, only additional process in milling tool inserts is periphery grinding operation. Presently turning and milling tool inserts are manufacturing in mixed flow process.

III. Existing System VSM

VSM is a mapping tool that maps not only material flows but also information flows that signal and control the material flows. This visual representation facilitates the process of lean implementation by helping to identify the value adding steps in a value stream and eliminating the non-value adding steps, or wastes. The focus of VSM is on a product "value stream" for a given "product family". The future state map forms the basis for the implementation plan, for focused improvement initiatives such as layout modification.

A. Current State Mapping

Value stream mapping of the current state identifies the essential and non-essential value added activities in the existing process. In PU5 it is identified that several bottlenecks raised due to increase in customer demand rate than the current production rate or operation cycle time. Comparing takt time; which depends on demand rate and quantity in the process flow, with the operations cycle time, it may be noticed that for both products, operations cycle time is greater than the takt time (Table 1).

B. Observations and Discussions

Production activity carried out in PU5is of mixed flow process which has many pit falls. In each flow workers are required to travel longer distances between machines / workstations, this causes increase the work in process inventory. Routing of process flow is long and difficult to follow. Important observations made in existing layout are given below;

Manufacturing operations of turning inserts and milling inserts have common machines, minimum distance between machine to machine is 3 meters and maximum distance is 48 meters which causes longer time for material movement, this contributes for higher machine idle time. Also it is observed that, because of independent coolant system for individual machines, effective space utilization of shop floor is only 32.7%. Further it was found that coolant leakages are taking place at many machines.

Huge total inventories of inserts are accumulated at work stations. Some machines are common in function and shared by other process where the pile up inventory occurs.

Demand rate is more than production capacity. It is observed that value added percent for Turning Inserts is 15.04 % and for milling inserts it is13.012 %which is very low.

Sintering is a monumental process, where in batch quantity is more than 10000 numbers in inserts and cycle time is more than 24 hours. Hence this activity may be kept out of the dedicated flow lines proposed for turning inserts and milling inserts manufacturing. As pressing operation is done prior to sintering operations, this operation also needs to keep out of flow lines. But work in process inventory at this operation is 236 kg and it stays for0.8401 days.

IV. FUTURE STATE MAPPING

Inputs for developing the future state are taken from current state, where target areas of improvement are discussed. Current demand rate of turning inserts is of 4.5 seconds per insert and 6.75 seconds per insert for milling inserts. Production activity in PU5 is modified into partly mixed flow line and partly dedicated flow line. Accordingly future state

developed comprises *mixed flow line zone* consisting pressing and sintering operations, followed by *dedicated flow lines zones for turning and milling inserts* consisting top and bottom grinding, periphery grinding (only for milling inserts), edge rounding, cleaning, and blasting operations, and *continued with mixed flow line* for operations such as coating, inspection, mark and dispatch[7-11].

Jobs are allocated to each operation for every 6 hours by considering their capacity i.e. by matching the demand rate and production capacity of machines. With proper job allocation and inclusion of new machines in certain operation where it needs future state map has projected substantial improvements in terms of reduced in process inventory, reduction in non-value added time, lead time etc. Important improvements which can be achieved are;

In process inventory has reduced at all the operations. Presently, with the future state map, total in process inventory is reduced up to 47 percent.

Reduction in production lead time from 12.392 days to 5.58 days for manufacturing of turning inserts and 14.092 days to 5.95 days for manufacturing of milling inserts.

Value added percent is increased to 45.02% for turning inserts and 42.02% for milling inserts.

V. DEVELOPMENT OF NEW LAYOUT

It is required to separate the certain operations of milling inserts manufacturing from existing layout due to increased requirement of space and for smoother the flow of inserts. In view of this it is necessary to develop new layout to house the machines required for top and bottom grinding, periphery grinding, edge rounding, cleaning and blasting machines. New layout is developed by considering the factors such as; machine area and other requirements, material movement distance, machine to machine distance and flow of inserts[4].

Layout developed is shown in Figure 1 for separated 5 operations of milling inserts manufacturing. Smoother flow of inserts has obtained with the separation of *five operations* of milling inserts manufacturing from existing layout. This separation made the availability of free shop floor area in PU5 to improve further in turning inserts manufacturing process and eliminating the mix up of inserts. Figure 2 depicts the modified layout of existing Production Unit which leaves out the separated machines of milling inserts manufacturing process. There are no big changes made in machine allocation of turning inserts manufacturing process[3].

VI. COMPARISON OF PROPOSED SYSTEM WITH EXISTING SYSTEM

Compared to existing system, several improvements are achieved with the adoption of proposed system; selected improvements are given in Table 2. In the new system dedicated machines are allocated for turning and milling inserts manufacturing process in some operations. Compared to existing system, new proposed system reduces in process inventory level by 47.47 %, reduces lead time from 12.392 days to 5.58 days for manufacturing of turning inserts, and reduces from 14.092 days to 5.95 days for manufacturing of milling inserts[6,12].

VII. CONCLUSIONS

Modification of existing layout leading to creation of separate layout for five operations of milling inserts manufacturing activity, addition of machines required, and reducing the job allocation time from 24 hours to 6 hours has resulted in a lot of improvements. Significant improvements are;

Lead time of milling inserts manufacturing is reduced from 14.092 days to 5.95 days and that of turning inserts is reduced from 12.392 days to 5.58 days. Percentage reduction in Lead time is 57.77% and 54.97% respectively.

Work-in-process Inventory is reduced from 210550 units to 110600 units, reduction of 47.5 percent.

Material handling distance is reduced from 315 meters to 265 meters

Value added percent for Turning Inserts is increased from 15.04 % to 45.02% and for milling inserts from 13.012 % to 42.02%

Better space utilization and flexibility in effecting changes in machines locations[5].

Existing mixed-flow line in Production Unit is converted into *mixed-flow zone to parallel dedicated flow lines zone mixed-flow zone* in two plant Units. Company has accepted the layouts and taken up for implementing the changes.
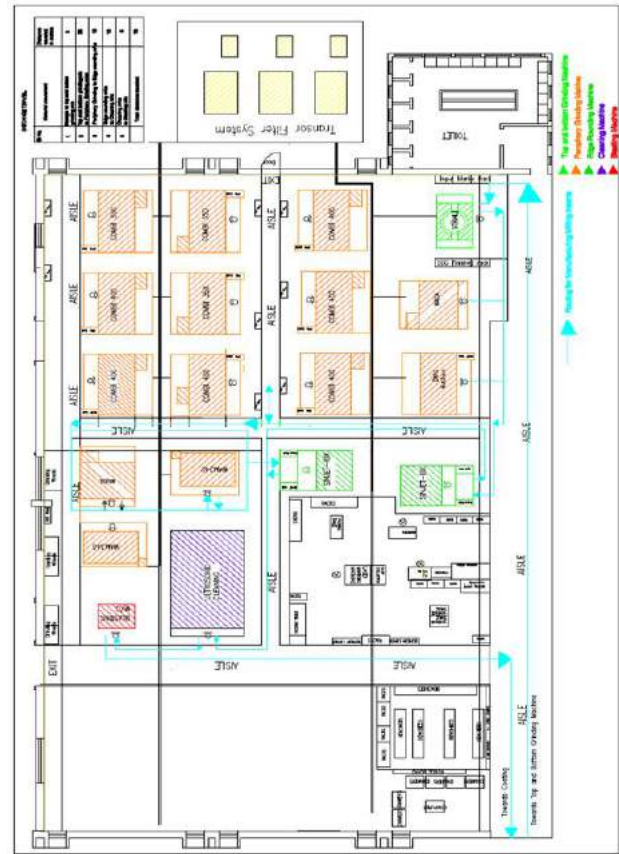
Products	Takt Time (seconds per part)	Operation Cycle Time (seconds/part)
Turning Inserts	4.5	5.943
Milling Inserts	6.75	8.91

No.	Details	Existing System	Proposed System
1	WIP	210550	110660
2	Layout Type	Traditional	Process
3	Process	Mixed Process	Dedicated Process
4	Lead Time	12.392 days for turning inserts	5.58 days for Turning inserts
		14.092 days for milling inserts	5.95 days for milling inserts

Table 2: Comparison of Proposed System with Existing System

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Review Paper on Maintenance and Treatment of Metal Working Fluids (MWF'S)

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ABSTRACT

The purpose of this project is to design a water distillation system that can purify water from nearly any source, a system that is relatively cheap, portable, and depends only on renewable solar energy. Distillation is one of many processes that can be used for water purification. This requires an energy input as heat, electricity and solar radiation can be the source of energy. When Solar energy is used for this purpose, it is known as Solar water Distillation. Solar Distillation is an attractive process to produce portable water using free of cost solar energy. This energy is used directly for evaporating water inside a device usually termed a "Solar Still". Solar stills are used in cases where rain, piped, or well water is impractical, such as in remote homes or during power outages. Different versions of a still are used to desalinate seawater, in desert survival kits and for home water Purification

Keywords – Purification, Convection, Distillation, Evaporation, Radiation.

I. INTRODUCTION

Metalworking fluids (MWFs) play a significant role in manufacturing processes such as forming, cutting and grinding. They influence heat generation in metalworking processes by reducing friction between tool and workpiece. Cooling is furthermore achieved by dissipating and conducting the generated heat. By their lubricating and cooling properties, MWFs contribute to the avoidance of thermal damage of the workpiece material and reduce wear of the tool. In general we can define metalworking fluids as liquids, which are supplied to a manufacturing process in a way that allows for increased productivity based on lubricating and cooling effects. As general aspects of the fluids are discussed, which are mainly independent from the manufacturing process, commonly used terms such as coolant, lubricant, grinding oil, cutting fluid are summarized as MWFs.
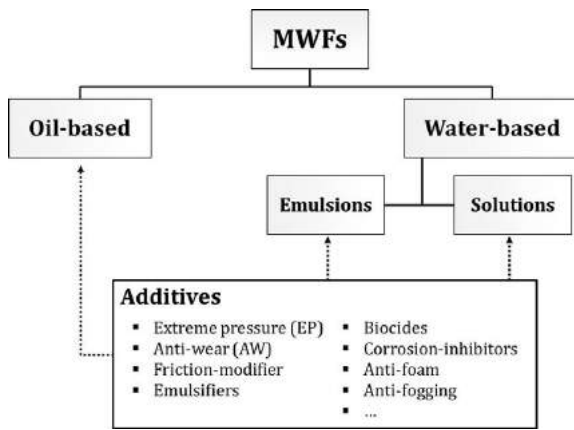
Fig. 1. Classification of the MWF types according to DIN 51385 (simplified).

Liquids which are included in the term MWFs have been classified based on different criteria like formulation (oil-based, water-based), manufacturing process (cutting fluid, grinding oil, forming oil, etc.), or quantity (flooding, MQL, etc.). Not all of these classifications are suitable to discuss MWFs and their properties from a mechanism-oriented point of view. According to DIN 51385, MWFs are classified following their composition as oil-based or water-based MWFs.

Specific properties are achieved by adding specific chemical substances (additives). Fig. 1 shows the classification of MWFs according to DIN 51385.
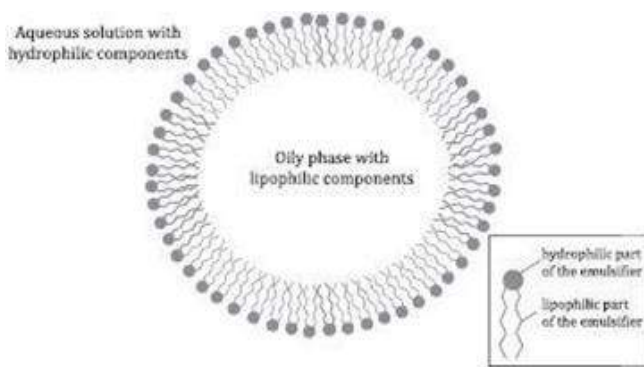
Fig. 2. A micelle of an oil-in-water-emulsion

1.1. History and demand for MWFs in manufacturing technology

Early approaches for the support of metalworking processes by fluids utilize two basic properties of liquids: their ability to dissipate heat and to reduce friction by lubrication. Leonardo da Vinci created several test set-ups allowing for the analysis of friction under varied conditions (Fig. 4). Beside of the use of pure fats and oils, early MWFs were mixtures of water (which has the highest heat transfer coefficient) and additional substances for the improvement of the MWFs' properties, especially the lubrication ability.
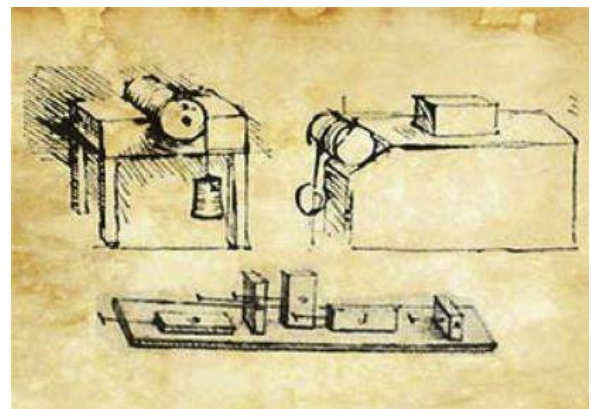
Fig. 2. Leonardo da Vinci's sketches of tribological test set-ups for the analysis of friction.

Natural products such as animal oils and fats (primarily whale oil, tallow, and lard)as well as vegetable oils from various sources such as olive, palm, castor, oil plant and

other seed oils were used to compose the first MWFs.They were applied in manufacturing processes
e.g. for the production of metal artwork and weapons in the middle age.In further work of da Vinci, a mixture of oil and corundum was applied for lubrication purposes in an internal cylindrical grinding machine.Special grooves were inserted to the grinding wheel to allow for efficient supply of the MWF to the tool.

In the early 19th century, the design of machine tools made considerable progress and simultaneously, the techniques for the supply of MWFs were

improved. In his autobiography James Nasmyth describes his inventions, e.g. a traversing drill, which had a small tank to supply water or soap in water ("as a lubricator") directly to the contact zone. The increased availability of mineral oil around 1850 had an intense influence on the composition of MWFs. The oil, which was a by-product of refining kerosene, was chosen to replace animal and vegetable oils in MWFs due to its low price.

With the progress of industrialization in the 20th century, there was an increasing need for MWFs with higher performance. It was found that the addition of substances containing sulphur and phosphor lead to improved lubricating ability of the applied MWFs. The sectors of aviation and automotive industry were the main drivers of these developments focusing on higher levels of productivity in mass production (cf. Fig. 5). "Trial & error" was a base principle for the development of new MWFs with improved functionality.

Fig. 3. Chronology development of MWFs

II. METAL WORKING FLUIDS:USES AND CONCERNS.

Metalworking fluids benefit a variety of metal cutting and shaping processes by cooling and lubricating the workpiece and tool, transporting chips out of the cutting zone, and imparting corrosion protection. Metalworking fluid chemistries are complex and vary significantly, depending on the manufacturing operation they are used in. By typical

definitions, there are four categories of MWFs: straight oils, soluble oils, semi-synthetics, and synthetics. Straight oils consist of a petroleum or vegetable oil base with or without specialty additives. The remaining three types of MWFs are water-soluble and are classified by the ratio of water to mineral oil in their concentrated form. The concentrate is usually diluted in 80 to 95 percent water when used in process. Typically, soluble oils contain greater than 20 percent mineral oil in the concentrate, while a semi-synthetic will typically contain 5 to 20 percent. Synthetic metalworking fluids contain no mineral oil. Water-soluble metalworking fluids contain varying amounts of specialty additives including lubricants, corrosion inhibitors, emulsifiers, chelating agents, pH buffers, defoamers, and biocides. Figure 4 illustrates the relative percentage of oil, water, and additives found in water- soluble MWFs.

Four major concerns have been raised about the state-of- the-art application of MWFs.4 First, particulates, tramp oils, and bacteria are known to reduce the quality of metalworking operations over time.5,6 Second, these contaminants eventually render the fluid ineffective for metalworking operations, creating significant acquisition and disposal costs that reduce profitability.7,8 Third, the disposal of MWF places a significant burden on the environment. And fourth, bacteria and the biocides used to control their growth in MWFs can be a significant health hazard.
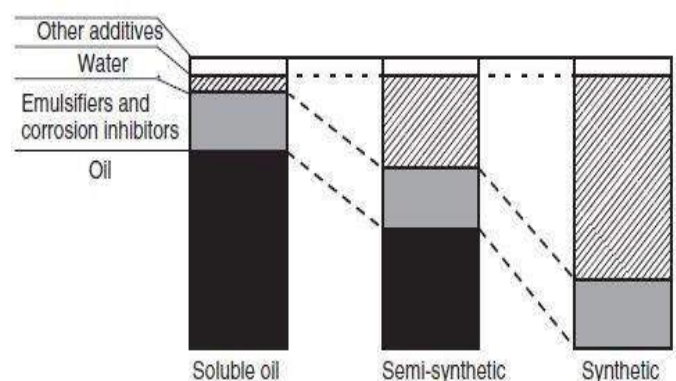
Fig.4. Relative proportion of water, oil, and additives in water-soluble MWFs.

III.   CONTAMINATION AND MONITORING TECHNIQUES FOR MWFs

There are several reasons for contamination of MWFs. It might be due to Temperature Change during machining Process, Chemical composition of Work piece, aging of a water-based MWF is its colonization by microorganisms (microbial contaminations or due to surrounding Environment. Metalworking fluids have a variety of environmental liabilities associated with them that the industry is currently trying to reduce. Fundamental solutions to these environmental problems can take the form of MWF volume reduction, alternative MWF application strategies, MWF formulation changes, and MWF recycling technologies. However, most of these solutions require fundamental understanding and change at the metalworking process level. Not surprisingly, the solutions that have been most readily adopted have been those involving the least amount of manufacturing change. This is due to large data and modelling gaps that exist with respect to MWF usage.

Appropriate tests to be carried out on water-mix metalworking fluids in use are set out below. For routine monitoring purposes a limited group of tests is usually all that is needed for each machine/system; these are highlighted in red as a general indication and may be carried out in-house with relatively simple equipment. A wider range of tests may be required if more in depth information is needed, for example to investigate a problem.
· Appearance.
· pH.
· Concentration.
· Emulsion Stability.
· Microbial Aspects.

These parameters are needs to tested in regular intervals Fortunately, maintaining concentration and general fluid condition go a long way to ensuring that pH stays in control. The pH value provides much information on fluid condition because growth of bacteria, low concentration, contamination and incipient separation may be signalled by a fall in pH. Specific additives can be used to restore pH to its correct value, but whether this is the right course of action is best decided by a specialist, taking into account the overall condition of the fluid.

IV. CORRECTIVE ACTIONS

In principle most of the corrective actions required to keep metalworking fluids in good condition can be carried out in house. However, determination of the most appropriate action is not always straightforward. For example, when a very high bacterial count is found from dip slide testing, it may seem reasonable to treat the fluid with biocide. Moreover, the result of such action may seem to have been completely successful when a low count is found following the biocide addition. But although bacteria are very small, when there are millions of them they do have a finite mass and the dead disrupted cells are still floating around in your fluid releasing substances which can be injurious to health. It follows that it is far preferable to control bacteria at a relatively low level, rather than going for mass kill when their numbers have grown out of hand.

If the fluid concentration has become far too high you could just add plenty of water. The trouble with this strategy is that the resulting emulsion may not be stable, especially if tramp oil also present. The preferred practice of keeping concentration in control and adjusting when necessary by moderate additions of half strength emulsion will give much better results.
Tramp oil skimmers come in a variety of configurations, most
of which depend on a similar principle – oil is collected on a material which, owing to surface tension effects, has a greater affinity for oil than for the aqueous emulsion and then removed by physical

means such as scraping or squeezing. The material may be in the form of a rotating disc, continuous belt, loop of tubular plastic or a mop, partially immersed in the fluid. The efficiency of the process is greatly improved if the skimmer is positioned at a point where the circulation of the fluid is slowed thus enabling oil to separate to the surface. An alternative design involves a container (separator) packed with plastic rings to which tramp oil adheres as the fluid passes through. Separate outlets enable clean fluid to flow back to the machining facility, while oil is collected in a container for disposal. In rolling mills or other large systems the mixture of fluid and tramp oil may be fed to the separator from floating suction heads. Fines from ferrous metals may be removed by magnetic separators which are commonly fitted to grinding machines, the collected material being scraped off for disposal. Weir systems are also used for removing high density fines. Centrifuges are extremely effective in removing all types of fines. However, it is vital to empty the bowl in which the sediment collects regularly. If the bowl is overfilled not only does collection of fines cease, but the disc stack can become blocked resulting in a tedious manual cleaning process. A self-discharging centrifuge eliminates this problem by automatically emptying the bowl without the need to stop; however, such machines have a higher capital cost. Centrifuges are also capable of removing tramp oil from water-mix metalworking fluids. Hydrocyclones (which have no moving parts) work on the same general principle as centrifuges, accelerating the effect of gravity by centrifugal force, to separate solids from fluids. Removal of solids from metalworking fluids by filtration is carried out using paper, fabric and mesh filters. Paper filters may be in the form of rolls (which are moved on automatically to expose a fresh filtration surface), sheets (used in plate and frame filter presses) or as pleated paper cartridges. Selection of the most suitable type depends on the quantity of solids to be removed and the degree of cleanliness required.

Paper roll filters and filter presses can remove much heavier solids loadings and are found on larger systems. Cartridge filters, with their much more limited dirt capacity, are more suitable for individual machine tools where cleanliness is critical. They are also useful for secondary filtration when the main bulk of solids have been removed. For neat oils which have become contaminated by moisture 'blotter' cartridges are available which absorb water as well as ensuring a high degree of cleanliness. Cartridge filters must be discarded when their dirt capacity has been reached and are relatively costly, being reserved for critical applications. Fabric filters are available in rolls, as specially designed double to fit recessed plate filter presses and in bag form supported in a cylindrical container.

Rotary drum filters, some models of which operate under vacuum, are capable of continuously removing substantial solids loadings from the fluid. They are available in a range of capacities, the largest serving major machining facilities. Mobile filtration units can be wheeled from machine to machine, removing the contents of the sump (swarf and metalworking fluid) by suction. The fluid is filtered and returned to the machine using the onboard pump. Mobile units also enable the fluid to be held during thorough cleaning of the machine tool coolant system. Some processes, such as cold forming in the manufacture of fasteners and seamless tubes, generate large quantities of fine, solids in the form of a 'sludge' which may require treatment in two stages, the first to remove the bulk of solids and the second stage to achieve the desired degree of cleanliness. Many of the units for the foregoing treatments operate automatically and units combining more than one of the methods are available, for example magnetic separation and filtration. A further option is to incorporate fluid cooling into the treatment process. Complete turnkey installations for coolant treatment and swarf handling are also available.

Control of microorganisms (bacteria and fungi) is mainly effected by use of biocides although a number

of physical methods are available or being developed. Some water-mix metalworking fluids contain a biocide (or biocides) in the concentrate as supplied, whilst others depend upon the inherent resistance of the constituents of the formulation to microbiological spoilage to protect the emulsion in use. 'Tankside' additions of biocide may be found to be necessary during service to maintain resistance to spoilage. Such additions should be based on the outcome of monitoring tests and made accurately by trained personnel.

V. CONCLUSIONS

Good fluid management practice, with correct control of concentration, offers a degree of protection against microbiological spoilage by ensuring that pH is maintained. The extent to which pH is an effective means of control of microorganisms is the subject of current research. Alternative or complementary methods for control of microorganisms which have been investigated for use in water-mix metalworking fluids include exposure to heat, ultraviolet radiation, ozone, silver, ultrasound and bacteriophages.

Following the large outbreak of respiratory diseases at the Powertrain plant, which are believed to have been associated with used metalworking fluids containing bacteria, research is being carried out with the objective of achieving a more fundamental understanding of the cause(s) of these disorders. A specific group of metalworking fluids known as Bio concept fluids are formulated to operate with a controlled population of 'friendly bacteria' which are intended to discourage the proliferation of undesirable bacteria. Good fluid management is still required for these fluids.

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Design and Fabrication of Solar Still

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ABSTRACT

The purpose of this project is to design a water distillation system that can purify water from nearly any source, a system that is relatively cheap, portable, and depends only on renewable solar energy. Distillation is one of many processes that can be used for water purification. This requires an energy input as heat, electricity and solar radiation can be the source of energy. When Solar energy is used for this purpose, it is known as Solar water Distillation. Solar Distillation is an attractive process to produce portable water using free of cost solar energy. This energy is used directly for evaporating water inside a device usually termed a "Solar Still". Solar stills are used in cases where rain, piped, or well water is impractical, such as in remote homes or during power outages. Different versions of a still are used to desalinate seawater, in desert survival kits and for home water Purification

Keywords – Purification, Convection, Distillation, Evaporation, Radiation.

I. INTRODUCTION

Due to environmental issues and limited fossil fuel resources, more and more attention is being given to renewable energy sources. In the recent years solar energy has been strongly promoted as a viable energy source. One of the simplest and most direct applications of this energy is the convergence of solar radiation into heat.

Solar radiation can be widely used for water heating in hot water systems, swimming pools as well as a supporting energy sources for central heating installations.

The energy of the solar radiation is in this case converted to heat with the use of solar panel. Using the sun's energy to heat water is not a new idea. More than one hundred years ago, black painted water tanks.

Water is a basic necessity of man along with food and air. Fresh water resources usually available are rivers, lakes and underground water reservoirs. About 71% of the planet is covered in water, yet of all of that 96.5% of the planet's water is found in oceans, 1.7% in groundwater,1.7% in glaciers and the ice caps and 0.001% in the air as vapor and clouds, Only2.5% of the Earth's water is fresh water and 98.8% of that water is in ice and groundwater. Less than 1% of all freshwater is in rivers, lakes and the atmosphere.

II. ABOUT SOLAR ENERGY

The sun radiates the energy uniformly in all direction in the form of electromagnetic waves. When absorbed by body, it increases its temperature. It is a clean, inexhaustible, abundantly and universally available renewable energy.

Solar energy has the greatest potential of all the sources of renewable energy and if only a small amount of this form of energy could be used, it will be one of the most important supplies of energy, especially when other sources in the country have depleted. This solution is solar water distillation. It is not a new process, but it has not received the attention that it deserves. Perhaps this is because it is

such a low-tech and flexible solution to water problems. Nearly anyone is capable of building a still and providing themselves with completely pure water from very questionable sources. 3.8x1024 joules of solar radiation is absorbed by earth and atmosphere per year. Solar power where sun hits atmosphere is 1017 watts and the total demand is 1013 watts. Therefore, the sun gives us 1000 times more power than we need. If we can use 5% of this energy, it will be 50 times what the world will require. The energy radiated by the sun on a bright sunny day is 4 to 7 KWh per m^2.

III. INTRODUCTION TO SOLAR STILL

Solar distillation is a tried and true technology. The first known use of stills dates back to 1551 when it was used by Arab alchemists. Other scientists and naturalists used stills over the coming centuries including Della Porta (1589), Lavoisier(1862), and Mauchot (1869)[3]. The first "conventional" solar still plant was built in 1872 by the Swedish engineer Charles Wilson in the mining community of Las Salinas in what is now northern Chile (Region II). This still was a large basin-type still used for supplying fresh water using brackish feed water to a nitrate mining community. The plant used wooden bays which had blackened bottoms using logwood dye and alum. The total area of the distillation plant was 4,700 square meters. On a typical summer day this plant produced 4.9 kg of distilled water per square meter of still surface, or more than 23,000 litres per day. Solar water Distillation system also called "Solar Still". Solar Still can effectively purify seawater & even raw sewage. Solar Stills can effectively removing Salts/minerals {Na, Ca, As, Fe, Mn},Bacteria {Ecoli, Cholera, Botulinus}, Parasites ,Heavy Metals & TDS[2]. Basic principal of working of solar still is "Solar energy heats water, evaporates it (salts and microbes left behind), and condenses as clouds to return to earth as rainwater".

IV. LITERATURE REVIEW

Joel Gordes et.al Worked on "Basic studies on Solar Stills". Solar distillation uses the heat of the sun directly in a simple piece of equipment to purify water. The equipment, commonly called a solar still.

Arunkumar T et.al [1]Worked on the "Effect of air flow on tubular solar still efficiency". An experimental work was reported to estimate the increase in distillate yield for a tubular solar still. The experiment was carried out in two modes without and with air flow between inner and outer tubes. And they concluded that the rate of air flow was fixed throughout the experiment.

Arunkumar.T et.al [2]Worked on the "Experimental Study on a Compound Parabolic Concentrator Tubular Solar Still Tied".They found that the relative humid of the humid air was definitely not saturated and the hourly evaporation, condensation and production fluxes were proportional to the humid air temperature and relative humidity.

Ajeet Kumar Rai et.al [3]Investigated on the "Experimental Study of Double Slope Solar Still with Energy Storage Medium". Andthey conducted an experiment to enhance the productivity of double slope solar still by storage of thermal energy in day time with the help of phase change materials (PCM). Overall 23% gain was observed when paraffin wax was used in solar still.

Ajeet Kumar Rai et.al [4]Observed on "Experimental Study of a Tubular Solar Still with Phase Change Material". Experiments were carried out on tubular solar still in Allahabad climate conditions. And it was concluded that the productivity of solar still increase by 20% when energy storage medium is used.

AmimulAhasanet .al [5]Worked on "Production Model of Tubular Solar Still Based on Condensation Theory". A production model based on a film-wise condensation theory for a Tubular Solar Still taking account of the thermal resistance of the unsaturated humid air inside the still was developed in this study. And it was found that the thermal resistance coefficient was reversely proportional to the dry air pressure fraction.

V. OBJECTIVES

For high efficiency the solar still should maintain high feed (undistilled) water temperature A large temperature difference between feed water and condensing surface Low vapour leakage. A high feed water temperature can be achieved if a high proportion of incoming radiation is absorbed by the feed water as heat. Hence low absorption

glazing and a good radiation absorbing surface are required. Heat losses from the floor and walls are kept low. The water is shallow so there is not so much to heat.

A large temperature difference can be achieved if the condensing surface absorbs little or none of the incoming radiation condensing water dissipates heat which must be removed rapidly from the condensing surface.

VI. FABRICATION

The methodology of the work consists of following stages:

STILL BASIN

It is the part of the system in which the water to be distilled is kept. It is therefore essential that it must absorb solar energy. Hence it is necessary that the material have high absorbtivity or very less reflectivity and very less transmitivity. These are the criteria's for selecting the basin materials. Kinds of the basin materials that can be used are as follows: 1. Leather sheet, 2. Ge silicon, 3. Mild steel plate, 4. RPF (reinforced platic) 5. G.I. (galvanised iron). We have used blackened mild steel sheet(K= thermal conductivity= 300W/m0C) (3mm thick).

Outer tank is of size (400*305*h1=150mm,h2=250mm), and painted with black color to absorb heat from the sun light and outer layer is painted with grey color .

Inner tank is of size (350*200*10mm), and painted with non-corrosive paint and black paint inside the tank

Fig. 1Outer and inner tank made by bending and arc welding

Fig. 2 Painted Outer and inner tank

TOP COVER

The passage from where irradiation occurs on the surface of the basin is top cover. Also it is the surface where condensate collects. So the features of the top cover are: 1) Transparent to solar radiation, 2) Non absorbent and Non-adsorbent of water ,3) Clean and smooth surface. The Materials Can Be Used Are: 1) Glass, 2) Polythene. We have used glass (3mm)

Fig.3 Top Cover with Glass

CHANNEL

The condensate that is formed slides over the inclined top cover and falls in the passage, this passage which fetches out the pure water is called channel. The materials that can be used are: P.V.C., 2) G.I. , 3) RPF . We used V-shaped mild steel channel .

Fig. 4 Channel

SUPPORTS FOR TOP COVER

The frame provided for supporting the top cover is an optional thing. I.e. it can be used if required. We have used fiber stick as a support to hold glass (size :: 5 mm X 5mm). The only change in our model is that we have to make the model as vacuumed as possible. So we have tried to make it airtight by sticking tape on the corners of the glass and at the edges of the box from where the possibility of the leakage of inside hot air is maximum.

Fig. 5 Fabricated Model

INLET PIPE FITTINGS

Inlet pipe is made up of mild steel and is of 2mm diameter and brass pipe of 2mm diameter is connected to inlet pipe to inner tank. Ball type gate valve is connected to the inlet valve.

Fig.6 Pipe Fittings

OUTLET PIPE CONNECTIONS

Outlet pipe is made up o mild steel and it is of 2mm diameter .water collector is connected to the outlet pipe.

Fig. 7 Pipe Connections

V. OPERATION

Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar panels are rigid, but semi- flexible ones are available, based on thin-film cells. Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the panels may contain silver, copper or other non-magnetic conductive transition metals. The cells must be connected electrically to one another and to the rest of the system. Externally,

popular terrestrial usage photovoltaic panels use MC3 (older) or MC4 connectors to facilitate easy weatherproof connections to the rest of the system. Bypass diodes may be incorporated or used externally, in case of partial panel shading, to maximize the output of panel sections still illuminated. Solar cells become less efficient at higher temperatures and installers try to provide good ventilation behind solar panels.

Water to be cleaned is poured into the still to partially fill the basin. The glass cover allows the solar radiation to pass into the still, which is mostly absorbed by the blackened base. This interior surface uses a blackened material to improve absorption of the sunrays. The water begins to heat up and the moisture content of the air trapped between the water surface and the glass cover increases. The heated water vapor evaporates from the basin and condenses on the inside of the glass cover. In this process, the salts and microbes that were in the original water are left behind. Condensed water trickles down the inclined glass cover to an interior collection trough and out to a storage bottle. Feed water should be added each day that roughly exceeds the distillate production to provide proper flushing of the basin water and to clean out excess salts left behind during the evaporation process. If the still produced 3 litres of water, 9 litres of make-up water should be added, of which 6 litres leaves the still as excess to flush the basin.

VI. CALCULATIONS

Sl.no.	Parameters	Symbol	Design parameter of solar still
1	Solar declination	Δ	$\delta = 23.45 \sin[0.9863(284 + n)]$
2	Angle	B	$\delta = -23.3$ $\beta = (\Phi - \delta)$
3	Slope of collector	Ic	$\beta = 40° 48'$ $Ic = Ih \times Cos$
4	Intensity of insolation on horizontal	Is	θ $Ic = 450 \ W/m2$
5	Intensity of insolation on sloping surface	θh	$Is = Ih \times Cos\ \theta/ Cos\ \theta h$ $Is = 594.5 \ W/m2$
6	Cosine of θh		$\theta h = 40°.8'$

Table 1. Solar Radiation Data

Angle of declination of flat plate

$\delta = 23.45 \ Sin[360/365(284/n)]$

Where n=day of the year

$= 23.45 Sin[360/365(284/122)]$

$$\delta = 15.21°$$

$Cos\theta = Sin\phi Sin\delta + Cos\phi Cos\delta Cos\omega$

$= Sin (15.21) Sin (12.58-10) + Cos (15.21) Cos (45) Cos(12.58-10)$

$$\theta = 46.095°$$

Zenith angle

$Cos\theta = Sin (12.58) Sin (15.21) + Cos (12.58) Cos (15.21) Cos45$

$$\theta = 43.689°$$

Azimuth angle

$Cos\gamma = Cos\theta Sin\phi – Sin\delta / Sin\theta Cos\phi$

$= Cos (43.689) Sin (12.58) – Sin (15.21)/ Sin (43.689) Cos (12.58)$

$$\gamma = 62.72°$$

Global Radiation I_g reaching a horizontal surface on the earth is given by

$$I_g = I_b + I_d$$

$$I_g = I_{bn} Cos\theta + I_d$$

$$I_{bn} = A \ exp \ (-B/cos\theta)$$

$I_{bn} = 865.86 \ w/m^2$

$I_d = c \ I_{bn}$

$I_d = 112.56 \ w/m^2$

Global Radiation $I_g = 978.42 \ w/m^2$

Efficiency

$$\eta = APh_{fg} / 3600I_g$$

where

A= Collecting area in m^2

P = Daily production in kg

h_{fg} = latent heat KJ/kg

$\eta = 22.94\% \approx 23\%$

VII CONCLUSIONS

Distillation is a method where water is removed from the contaminations rather than to remove contaminants from the water. Solar energy is a promising source to achieve this. This is due to various advantages involved in solar distillation. The Solar distillation involves zero maintenance cost and no energy costs as it involves only solar energy which is free of cost.

It was found from the experimental analysis that increasing the ambient temperature from 32°C to 47°C will increase the productivity by approx. 12 to 23%, which shows that the system performed more distillation at higher ambient temperatures. When inverted type absorber plate was used thermal efficiency of single slope solar still was increased by 7 %.

It was observed that when the water depth increases from 0.01m to 0.03m the productivity decreased by 5%.These results show that the water mass (water depth) has an intense effect on the distillate output of the solar still system.

Solar still productivity can also increase by use of reflector by 3%. The use of the mirror reflector will increase the temperature of the solar still basin; such an increase in the temperature is because of the improvement in solar radiation concentration.

The solar radiation increase from 0 MJ/m2 /h to 6 MJ/m2 /h has increased the productivity of the still by 15 to 32%. However the increase of the solar radiation parameter will increase the solar energy absorbed by the basin liner.

The main disadvantage of this solar still is the low productivity or high capital cost per unit output of distillate. This could be improved by a number of actions, e.g. injecting black dye in the seawater, using internal and external mirror, using wick, reducing heat conduction through basin walls and top cover or reusing the latent heat emitted from the condensing vapour on the glass cover. Capital cost can be reduced by using different designs and new materials for construction of solar stills.

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An Experimental Investigation in Generation of Electrical Energy from Teg (Bi2 Te3)

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ABSTRACT

With the increasing in price on petroleum products due to the depletion in source of availability and also increase in the rate of consumption as automobiles are increasing in quantities day by day. When the fuel is burnt, 20% to 25% of the heat generated in the fuel combustion process is converted into useful mechanical work and remaining heat is emitted to the environment through the exhaust gases and the engine cooling systems, resulting in an enormous waste of energy. If we can trap such unused heat energy and try generating electric power using Thermoelectric Generator we can store that electrical energy and can be used as power backup or can run the electrically operated equipment's. The increasing amount of electrical and electronic devices on vehicles provides more comfort and convenience for users, while places higher requirements on vehicle power supply. In this paper an effort is made to prepare a lab scale model setup and has conducted an experimental study of the characteristic behavior of TEG (Bi2 Te3) using copper as a base plate of 5mm thick & aluminum base plate of 10mm thick & generates electrical energy under three different variable conditions.

1.   Varying the thickness of aluminum supporting block at different mechanical loading condition

2.   Varying the thickness of aluminum supporting block at maximum constant mechanical loading without TIM or Thermal Grease.

3.   Varying the thickness of aluminum supporting block at maximum constant mechanical loading with TIM or Thermal Grease.

Based on the results of the above experiments, electric power generation found to be maximum at 408.01N. This load was considered as standard load and experiments were conducted for different thickness of aluminum supporting block with and without the application of thermal grease. It was observed that with the application of thermal grease there was an increase of 37% in electric power generation.

Keywords: TEG's, Bismuth Teluride, Seebeck Effect

I. INTRODUCTION

TEGs are devices which convert heat (temperature differences) directly into electrical energy, using a phenomenon called the "Seebeck effect" (or "thermoelectric effect").

Automotive industry is one of the main application fields of TE technologies. Among all the possible applications of TEG technologies, vehicle

waste heat harvesting by thermoelectric generator (TEG) is generally believed to be a feasible trial . The reasons for this belief is straight-forward and intuitive. One of the main reasons is that a large portion of all generated energy from combustion engine is emitted as waste heat. For a typical gasoline fueled internal combustion engine vehicle, only about 25% of the fuel energy is utilized for vehicle mobility and accessories; the remainder is lost in the form of waste heat and coolant, as well as friction and parasitic losses (Figure 1.1). which provides possibility of desired large temperature gradients for TEGs. Exhaust gas system is an example of waste heat harvesting location.

From another perspective, many other industrial developments urge the development of TEGs for automotive applications. The increasing amount of electrical and electronic devices on vehicle provides comfort and convenience for users, while places higher requirements on vehicle power supply. Furthermore, the global gasoline shortage gives rise to the necessity of the development of hybrid engine vehicles (HEV), which entails more efficient, economic and environment-friendly method of providing power sources for vehicles. These facts greatly spark research interests on TEG for vehicles
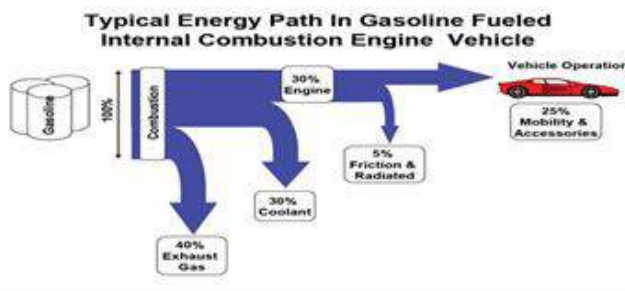
Figure 1.1: Typical energy path in gasoline fuelled internal combustion engine vehicles [8].

Consequently there are two general ways to reduce vehicle fuel consumption:

1. Increase the overall efficiency of the power train

2. Waste heat from the exhaust gas from the vehicle accounts for a considerable portion of the fuel energy that is not utilized, about 40% from figure (1.1).

Therefore a means to improve the fuel economy is to increase the overall efficiency of the Power train by recovering waste heat from the exhaust gas of the vehicle.

II. LAB SETUP MODEL
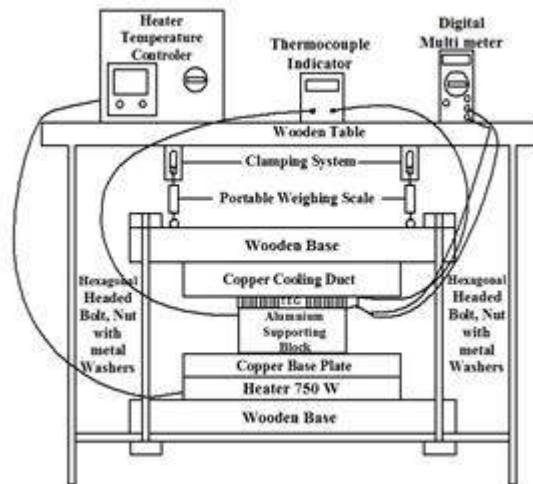
Figure 1.2 Schematic Diagram of Experiment set up

The subparts of the Setup are as follows:

1) Heater with controller,

2) Two Wooden plates with 12mm bolts of 4 numbers,

3) Copper base plate (5mm thick), aluminum base plate (10mm thick)

4) Aluminum supporting block of Variable thickness (5mm, 10mm, 15mm, 20mm & 30mm thick),

5) Thermo electric Generator device (Bi2 Te3), 6) Cooling duct made of Copper,

7) Portable weighing scale,

8) Thermocouple Indicator,

9) Silicon based grease loaded with Zinc oxide.

A wooden plate is clamped by a pair of 12mm bolts at the bottom of the frame. Over it a mica heater is placed and it is connected to the heater controller unit (HCU). A thermocouple is placed above the heater to sense the temperature in order to control the heating at set temperature. Above the heater a Copper base plate of 5mm thick or aluminum base plate of 10mm thick is placed because of its high thermal conducting ability. An aluminum supporting block is placed over the plate to safely control the heat at the bottom of thermoelectric generator, as well as to increase the gap between the heating and the cooling sides. A cooling duct in which

continuously water is circulating is placed above the TEG so as to increase the temperature difference on either sides of TEG. The entire set up is placed in this order and again clamped by a Hexagonal Headed bolt, Nut and metal washers on all 4 corners.

III. METHODOLOGY & RESULTS

Figure 1.3: Photographic View of Experiment set up
The experiments are conducted based on 3 major variables and the details are as follows:

Copper as base plate of 5mm thickness & aluminium base plate of 10mm thick & having aluminium supporting blocks of variable thickness of 5mm, 10mm, 15mm, 20mm & 30mm

CASE A: Varying the thickness of aluminium supporting block at variable mechanical loading.

CASE B: Varying the thickness of aluminium supporting block at constant maximum mechanical loading without application of Thermal Grease

CASE C: Varying the thickness of aluminium supporting block at constant maximum mechanical loading with application of Thermal Grease

CASE A: Power generation at variable thickness of aluminium supporting block at variable mechanical loading.

The experiment proceeds as follows:

STEP 1: Note the Weight of the cooling duct (with water) and the top most wooden plate.

STEP 2: Place it as per the specified order and lock the nut till it touches the surface.

STEP 3: By adjusting the height of weighing scale in the top, set the reading to zero.

STEP 4: Mark a reference point on all the 4 nuts and a reference lines on the wooden plate at an angle of 90o each.

STEP 5: Using wrench or spanner need to tighten all the 4 nuts by rotating the diagonally opposite nuts at an angle of 90o simultaneously and note down the mass applied.

STEP 6: Allow water to flow through the cooling jacket at a rate of 2 LPM

STEP 7: Switch on the console of controller and set the value to some temperature and make it constant.

STEP 8: Once it reaches a steady state, note down the voltage and current showing in the multimeter and also the hot and cold side temperature from the digital temperature indicator.

STEP 9: Repeat the STEP 5 & STEP 8 procedure and continue till we attain maximum tightening and note down the required details.

STEP 10: Increase the temperature for the next 10oC and repeat the STEP 5 & STEP 8 respectively

MECHANICAL LOAD CALCULATION:

NOTE: Here Total load applied = [mass of cooling duct with water (Kg)+ mass of wooden plate (Kg)+ mass applied by rotating all 4 nuts] X 9.81 m/s2

· At 0o Rotation the total load was 33 Newton [(2.335 + 1.035 + 0) X 9.81]

· At 90o Rotation the total load was 66.68 Newton [(2.335 + 1.035 + 3.427) X 9.81]

· At 180o Rotation the total load was 110.52 Newton [(2.335 + 1.035 + 7.897) X 9.81]

· At 270o Rotation the total load was 203.49 Newton [(2.335 + 1.035 + 17.37) X 9.81]

· At 360o Rotation the total load was 408.01 Newton [(2.335 + 1.035 + 38.22) X 9.81]

5mm Thick Aluminum Supporting Block at Varying Load

10mm Thick Aluminum Supporting Block at Varying Load

15mm Thick Aluminum Supporting Block at Varying Load

20mm Thick Aluminum Supporting Block at Varying Load

30mm Thick Aluminum Supporting Block at Varying Load
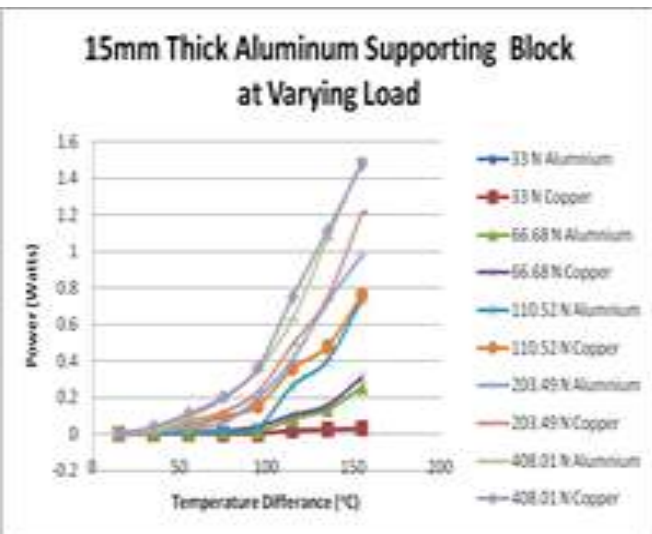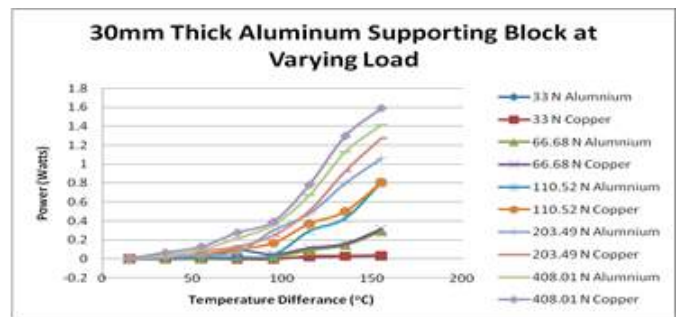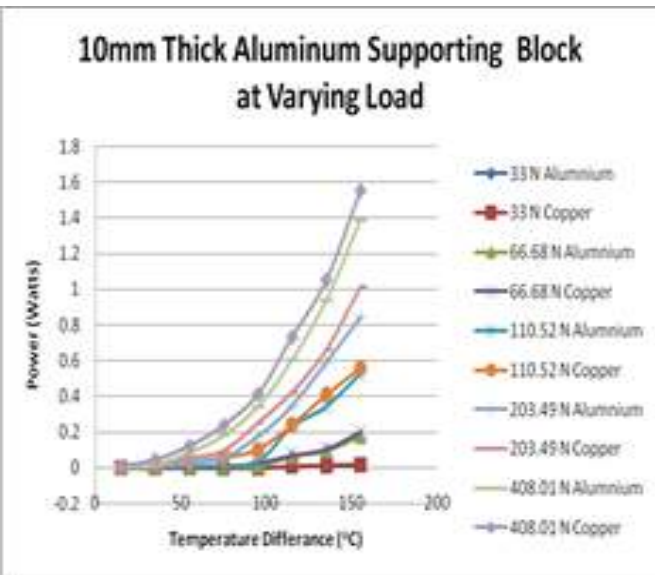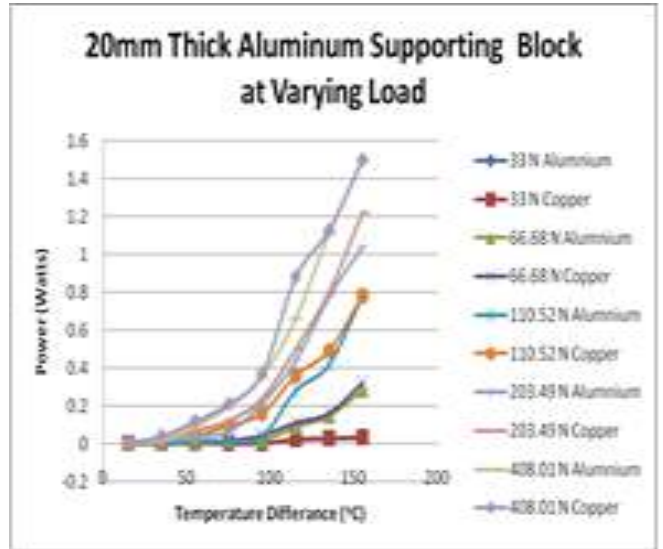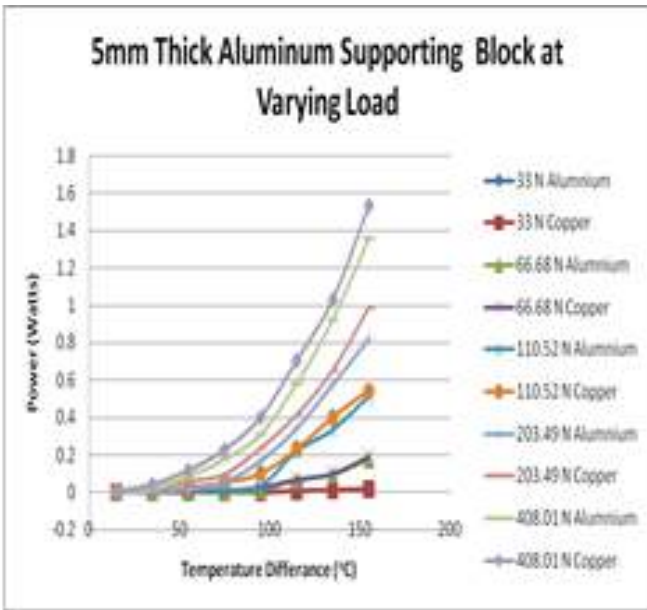
Graph 1.1: Power (Watts) vs Temperature difference (oC)

From graphs we can analyse that more the load we applay, more the power gets generated and in our setup we were able to reach maximum power generation at maximum load of 408.01N hence at that particular load we performed the CASE B & CASE C.

CASE B: Power generation at Variable thickness of aluminium supporting block at maximum constant mechanical loading 408.01 N without TIM or Thermal Grease.

STEP 1: Note the Weight of the cooling duct (with water) and the top most wooden plate.

STEP 2: Place it as per the specified order and lock the nut till it touches the surface.

STEP 3: By adjusting the height of weighing scale in the top , set the reading to zero.

STEP 4: Using wrench or spanner need to tighten all the 4 nuts by rotating the diagonally opposite nuts simultaneously to the maximum and note down the mass applied. (408.01 Newton)

NOTE: Here Total load applied = (mass of cooling duct with water + mass of wooden plate + mass applied by rotating all 4 nuts) X 9.81 m/s2

STEP 5: Allow water to flow through the cooling jacket at a rate of 2 LPM

STEP 6: Switch on the console of controller and set the value to some temperature

STEP 7: Once it reaches a steady state, note down the voltage and current showing in the multimeter and also the hot and cold side temperature from the digital temperature indicator.

STEP 8: Repeat the STEP 7 after increasing the set temperature for next 10oC.

CASE C: Power generation at Variable thickness of aluminium supporting block at maximum constant mechanical loading 408.01 N with TIM or Thermal Grease.

As if we see the readings of case A, we can understand more the tightening is done more the power is getting generated and reason is the reduction in air gap formed between the plates due to the 2 reasons:

·   Due to less tightening

·   Due to uneven of surfaces in microscopic level.

These air gaps which are formed between the Base plate to aluminum block, between the aluminum block to the TEG and between the TEG to the cooling jacket, in all these junctions the air gap is acting as a insulator due to thermal contact resistance. This drops the performance of TEG (Figure 1.4)

The tightening can be overcome by applying appropriate torque. But the uneven surface of the plates in microscopic level should be concentrated. they consist of "hills", "peaks" and "valleys". When these two surfaces are brought into contact with one another, only the peaks make contanct. It has been calculated that the average amount of contact between any two smooth surfaces is in reality only 5%. The other 95% are voids.
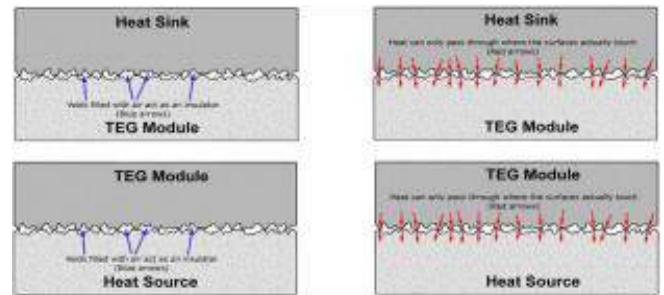
Figure 1.4: Effect of peaks and valleys when assembled [12]

Figure 1.4 shows how the remaining valleys creates voids through which heat energy can barely pass through, in effect creating an insulated area not the ideal thermal interface.

To avoid this Thermal contact resistance, A third party interface material is needed since it is all but impossible to achieve ideal flat and smooth surfaces. The purpose of using Thermal Grease is to fill the valleys and gaps with a material that has a much higher thermal conductivity (ability to transfer heat) than the air gaps it replaces. This essentially makes the entire interface transfer heat instead of just where the peaks were contacting. The following image shows how the situation has been dramatically improved.
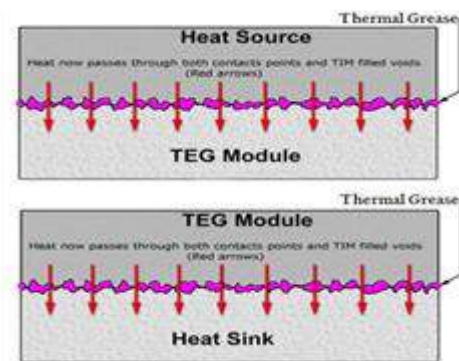
Figure 1.5: Effect of peaks and valleys after application of Thermal Grease [12]

By the application of Thermal grease in between the TEG Module, Heat source & Heat sink, this will enchance heat transfer between two surfaces by filling in the microscopic voids casued by surface roughness. Most thermal greases are also known as Thermal interface material (TIM) or transistor heat sink compound or thermal joint compound which are made up of silicon grease loaded with zinc oxide. Non silicone based compound are also available which in

most cases are superior but more expensive than silicone based alternatives.

Apply Thermal Grease on the Base plate, Aluminum blocks, TEG, Cooling duct and press it firmly in order to remove air gaps and then follow the steps of CASE B.

Now comparing the readings obtained from the procedure of CASE B & CASE C the graph is as follows.
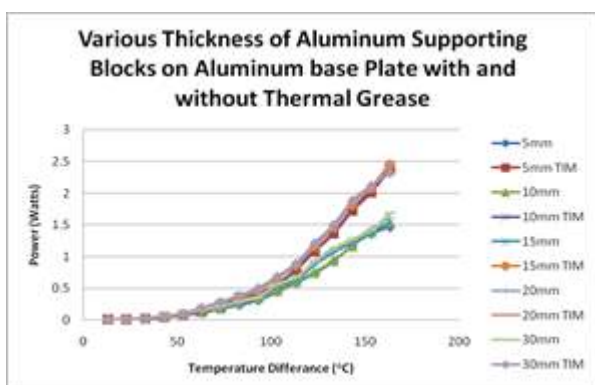
Graph 1.2: Power (Watts) vs Temperature difference (oC)
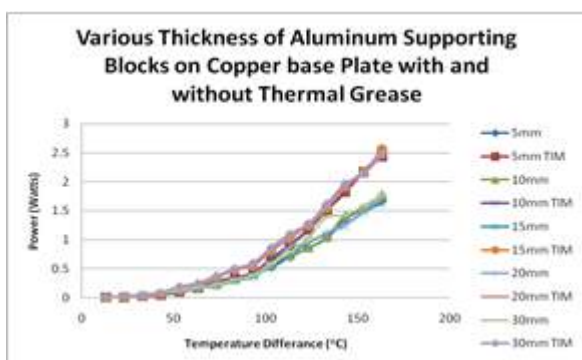
Graph 1.3: Power (Watts) vs Temperature difference (oC)

VI. CONCLUSION

There are several significant opportunities for thermoelectric recovery of waste heat. Through this work a thermoelectric generator has been used and characterized that produces enough power for a high intensity LED. An in depth analysis has been performed in selecting each component of the system to maximize power. A high temperature Bi_2Te_3 has been selected as the most cost effective module for this application.

With referance to the graph we conclude that 15mm thick Aluminum supporting block is best

suitable for both Aluminum base plate and copper base plate which is able to generate maximum electrical power with an increment of 37 % by applying thermal grease.

Hence thermoelectricity is a promising method of harvesting low-grade waste heat in applications where traditional methods are impractical.

Further the power requirement of any electrically operated equipment can be met by adding up more number of thermoelectric modules in a combination of series and parallel connections which can also improve the efficiency of the system and generate more electrical power.

V. FUTURE SCOPE

From the experiment conducted using the single TEG module, it is understood that proper Research and further studies in this field can result in effective utilization of the wasted heat for Generating power.

· By having multiple TEG connected in series and parallel will help us to generate more electrical power.

· As we know, more the temperature difference, more power can be developed. We can also improve the efficiency of TEG by insulating the component on the hot side but brings down the performance of the engine.

· We can also improve the efficiency by circulating coolant which is used in the radiators

· Having aluminium heat sink we can force the atmospheric air on it to have the cooling effect.

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Design and Development of Chalk Dust Cleaning Equipment

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ABSTRACT

Till today most of the schools and colleges are using traditional methods for teaching with help of chalk. The traditional duster eraser chalk dust is a common problem. Prolong breathing of chalk dust which spread over entire class may cause serious respiratory health problems. In this project a cleaning equipment is designed and developed to suck chalk dust particles from the duster eraser by vacuum technology in an eco-friendly way.

Keywords: Dust, Vacuum, Cleaning Equipment

I. INTRODUCTION

A vacuum cleaner, otherwise called a sweeper or may be a Hoover, is a gadget that utilizes a pneumatic machine, to make a halfway vacuum to suck up residue and soil from floors and from different surfaces, for example, upholstery and draperies. The soil is gathered by either a residue sack or a typhoon for later transfer. Vacuum cleaners, which are utilized in homes just as in industry, exist in an assortment of sizes and models—little battery-fueled hand-held gadgets, wheeled canister models for home use, residential focal vacuum cleaners, gigantic stationary modern apparatuses that can deal with a few hundred liters of residue before being exhausted, and self-moved vacuum trucks for recuperation of huge spills or evacuation of debased soil. Particular shop vacuums can be utilized to suck up both residue and fluids.

Towards the finishing of the nineteenth century the world was presented with the controlled cleaners, albeit early sorts utilized some variety of blowing air to clean rather than suction. One showed up in 1898 when John S. Thurman of St. Louis, Missouri presented a patent for a "pneumatic floor covering renovator" which blew dust into a container.

Thurman's framework, controlled by an interior ignition motor, headed out to the client's living arrangement on a pony drawn wagon as a component of a way to entryway cleaning administration. Corrine Dufour of Savannah, Georgia got two licenses in 1899 and 1900 for another blown air framework that appears to have highlighted the principal utilization of an electric engine.

In 1901 controlled vacuum cleaners utilizing suction were designed autonomously by British architect Hubert Cecil Booth and American designer David T. Kenney. Corner likewise may have instituted "vacuum more clean". Corner's pony drawn burning motor fueled "Puffing Billy", perhaps got from Thurman's blown air configuration," depended upon simply suction with air siphoned through a fabric channel and was offered as a major aspect of his cleaning administrations. Kenney's was a stationary 4,000 lb. steam motor fueled framework with funnels and hoses venturing into all pieces of the structure.

Figure 1: Vacuum Cleaner

II. EXPERIMENTAL EQUIPMENT AND INSTRUMENTS

Figure 2: Fabrication of Experimental Setup

The experimental setup (figure 2) consists of the following parts;

A. Frame

A frame is often a structural system that supports other components of a physical construction and/or steel frame that limits the construction's extent. The frame is of made up of wood. [270mm X 148mm X 168mm]

Figure 3: Fabrication Of The Frame

B. Vacuum pump

Figure 4: Vacuum Pump

Vacuum siphon is of 400watt which creates a suction of 0.3 bar.

C. Suction blades

These are sharp edges inside the siphon packaging which turn to deliver the suction.

Figure 5: Suction Blades

D. Dust collector

Regularly known as pack houses, texture authorities use filtration to isolate dust particulates from dusty gases. They are a standout amongst the most productive and practical sorts of residue gatherers accessible, and can accomplish an accumulation proficiency of over 99% for extremely fine particles. To guarantee the channel packs have a long use life they are regularly covered with a channel enhancer (pre-coat). The utilization of synthetically latent limestone (calcium carbonate) is most normal as it boosts proficiency of residue accumulation (counting fly fiery remains) by means of development of what is known as a dust cake or covering on the outside of the channel media. This snares fine particulates as well as gives insurance to the sack itself from dampness, and slick or sticky particulates which can tie the channel media. Without a pre-coat the

channel pack enables fine particulates to seep through the sack channel framework, particularly amid start-up, as the sack can just do some portion of the filtration leaving the better parts to the channel enhancer dust cake Is set beneath the suction opening, made up of small scale fiber containing pores of size < 800nm.And is a removable piece of the device.[dia-82mm, tallness 45mm .]
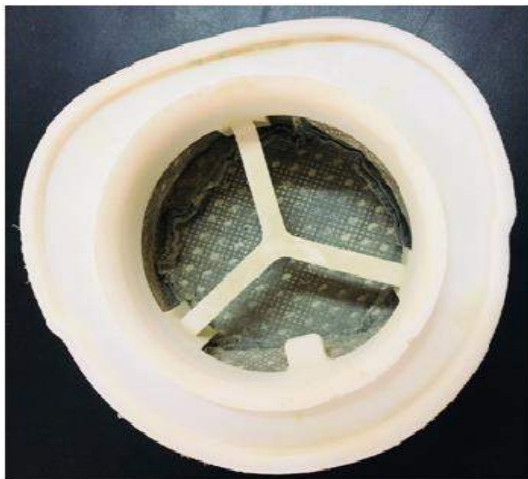
Figure 6: Dust collector

E. Duster

Is a material which is used to dust the blackboard by the means of a cotton bed stuck on a wooden piece and remove the unwanted chalk or the writings which are there on the blackboard? [145 × 45 × 35mm]

Figure 7: Duster

F. Opening plate

Is made up of wood, and is used to clear out the dust collected in the collector. [305 × 115] mm.

Figure 8: Opening plate

(g)   Air tight padding: -
This is placed below the suction slot, which helps in preventing the loss of suction pressure.
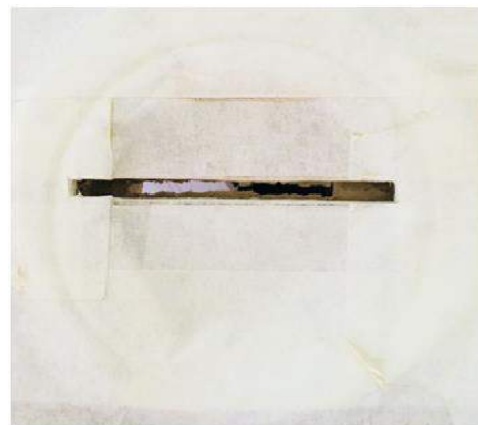
Figure 9: Air Tight Padding

H. Slot

This is placed on the opening plate, where the suction takes place along which the dust gets enters the device. [45 × 5mm]

Figure 10: Suction Slot

I. Conveyor belt

A transport line is the conveying mechanism of a belt transport framework. A belt transport framework is one of numerous kinds of transport frameworks. A belt transport framework comprises of at least two pulleys, with an unending circle of conveying medium the transport line that pivots

about them. Either of the pulleys are fueled, moving the belt and the material on the belt forward. The controlled pulley is known as the drive pulley while the unpowered pulley is known as the idler pulley.

Figure 11: Conveyor Belt

III. CAD MODELS

Followings are the cad model for various parts of the experimental setup.
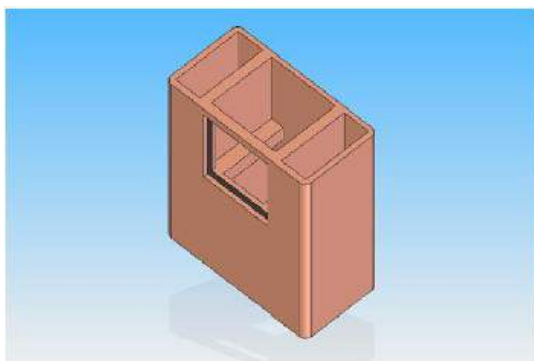
Figure 12: Body
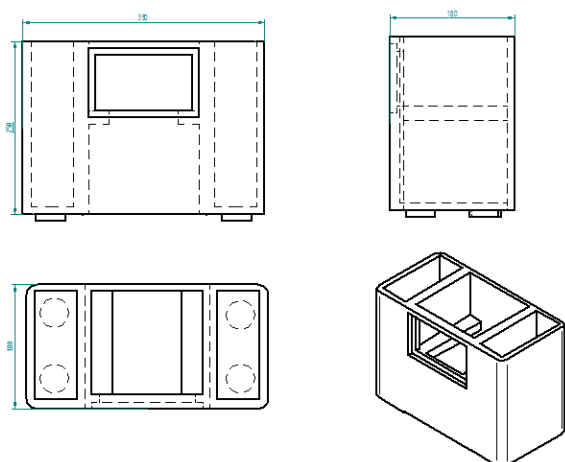
Figure 13: Front View, Top View & Isometric View of Body
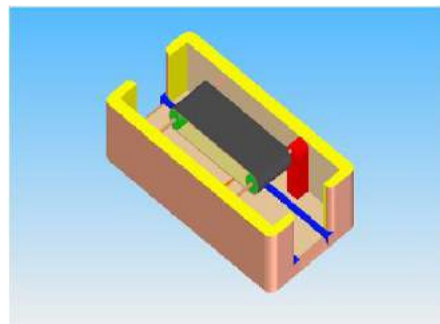
Figure 14: Conveyor system
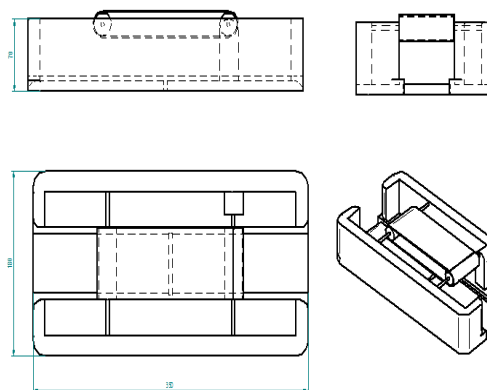
Figure 15: Front View, Top View & Isometric View of Conveyor System
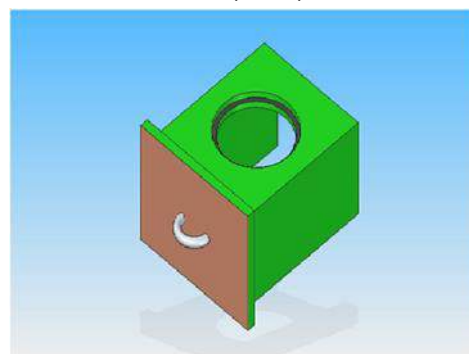
Figure 16: Dust Collecting Chamber
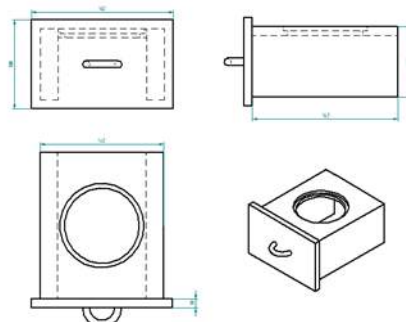
Figure 17: Front View, Top View & Isometric View of Dust Collecting Chamber
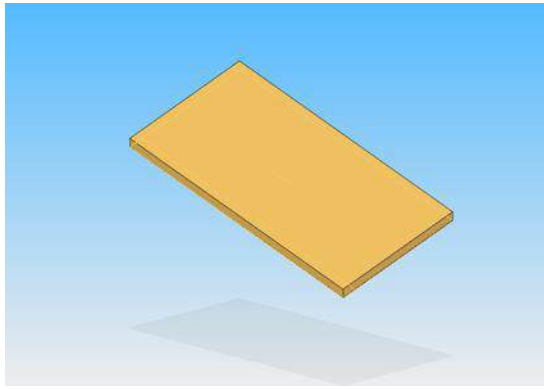
Figure 18: Top Plate
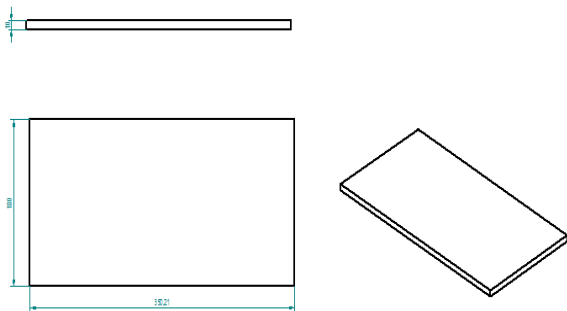
Figure 19: Front View, Top View & Isometric View
Of Top Plate
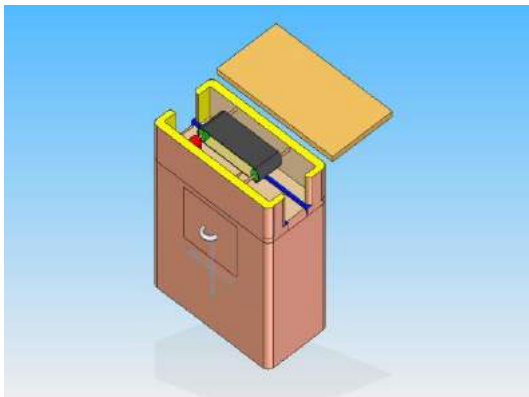
Figure 20: Final 3D View
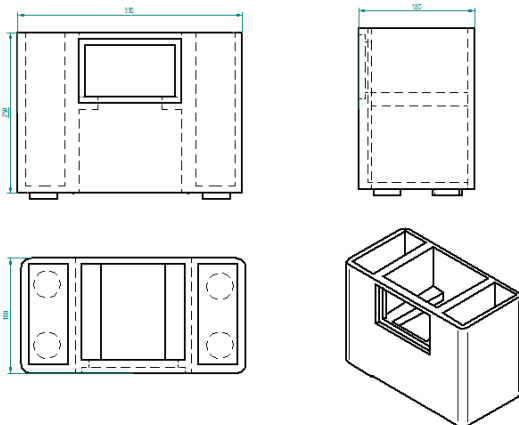
Figure 21: Front View, Top View & Isometric View
Of Final Product

IV. EXPERIMENTAL METHODS

i.   System works on vacuum process for cleaning the blackboard duster with the help of the vacuum motor.

ii.   Motor will run the vacuum pump. A simple on/off switch is also going to play minor role in this system for stopping the motor and thus the vacuum pump.

iii.   A vacuum dust collection system is used to collect and trap the dust found on the eraser.

iv.   When the duster is placed in the slot the hook-and-loop conveyor system pulls the duster inside the machine.

v.   When this is done the duster is wiped against the slot where in the vacuum process takes place and collects the dust from the duster.

vi.   Thus avoiding the chalk dust entering into the classroom atmosphere.

V. EXPERIMENTAL CALCULATIONS

1. Electricity consumption: - $E = W \times n$ kW/hr. --- (i)

2. Average cost of consumption: - $C = E \times 8.2 \times D$ Rs/month. ---------------------------- (ii)

Where,

E=Electricity consumption.

n=No. of hours used.

W=Operating Watts of the pump.

C=Average cost of consumption.

D=No. of days used.

Rs.8.2 = Cost per kWh in Karnataka.

Calculations

1. n = 6/60hrs
2. E= (400×6/60)/1000
   E=0.04 kWh
3. C= 0.04×8.2×26
   C=8.528 Rs/month
4. Conveyor speed = 45rpm

VI. CONCLUSION

The model has been designed to collect the chalk dust which was getting into the class room atmosphere and causing suffocation to the people. By using the vacuum principle and the microfiber, this machine can successfully collect the complete dust from the duster and avoid the dust getting into the classroom atmosphere.

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EVALUATION OF THERMAL PROPERTIES OF RAPESEED - BIOFUEL

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ABSTRACT

Rapeseed which is primarily cultivated for the rich oil content is the third largest producer of vegetable oil in the world. It is rich in protein and therefore also finds its applications as a suitable animal feed. An exhaustive study on Rapeseed derived Biofuel reveals its various properties which are found to be in close proximity to the properties of petroleum based fuels, hence indicating it as a suitable candidate for substituting the petroleum based fuels at different blend ratios. The study also highlights the various advantages of Rapeseed Biofuel over the conventional petroleum based fuels.

Keywords - Rapeseed Biofuels, Properties, Transesterification, Vegetable Oils, Biomass, Feedstock

I. INTRODUCTION

Rapeseed is grown mainly for animal feed, oil extraction through their oil rich seeds and for biodiesel production. It is one of the largest source of vegetable oil in the world and a leading source of protein rich meal. It produces much more oil for the same land occupancy, and therefore is a preferred oil stock for the production of biodiesel. Rapeseed derived Biodiesel can be used straight in diesel engines with few modifications. It can also be blended in various proportions with Petroleum derived diesel fuels. However, the production of rapeseed biodiesel requires excessive steps involving cultivating, crushing and refining which result in an overall increase in the cost of production. Also extra care must be taken to during their long term storage to avoid the problems of oxidation stability which renders the fuel unfit for usage. This additional set up requirements increases the cost per liter fuel produced. Therefore, on monetarily basis rapeseed derived biodiesel does not seem competent enough to replace the existing exponential demand of petroleum derived diesel fuels.

The study carried out reflects the comparison between the properties of petrodiesel and rapeseed biodiesel. A similarity in properties enables its usage on a large scale.

II. METHODOLOGY

This section discusses the production procedure for the rapeseed derived biodiesel.

Oil Extraction

1) Clean the rapeseeds by removing any plant material and dirt still attached to the seeds.
2) Place the rapeseeds in a flaking mill and turn on the mill. The mill has cylindrical rolls that turn in opposite directions to crush or flatten the seeds.
3) Heat the seeds. Pour the flaked seeds into a multistage cooker. Heat the seeds to 68 to 122 degrees Fahrenheit for preheating. Within five minutes steam heat to 248 degrees Fahrenheit.
4) Place the seeds into the oil extractor immediately after heating. The heat will make the oil separate easily from the seeds. Turn on the extractor. The machine crushes the oils out of the seed flakes until there is nothing left coming out of the seeds.

Transesterification

In organic chemistry, transesterification is the process of exchanging the alkoxy group of an ester compound by another alcohol. These reactions are often catalyzed by the addition of an acid or base.

The transesterification of vegetable oils, animal fats or waste cooking oils is the process behind conventional biodiesel. In the transesterification process a glyceride reacts with an alcohol (typically methanol or ethanol) in the presence of a catalyst forming fatty acid alkyl esters and an alcohol.

Blending and Testing

The transesterified oil was then used to prepare different blends with diesel in the ratios of 1:9 and 1:4. Hence obtaining the biofuel of required blends.

Figure 1. Different blends of rapeseed biofuel with traditional diesel

The above figure shows the blending of rapeseed derived bodiesel fuel in various proportions of petrodiesel. The mixture was blended for 15 minutes prior to testing using a magnetic stirrer set to 600 rpm. This was done to ensure completing mixing of both the fuels, and thus obtain a homogeneous mixture of the two.

III. STUDIES AND FINDINGS

Properties of diesel with rapeseed biodiesel:

The properties of the biodiesel give an indication of whether it would be suitable or not for the performance, life and emission of the engine. So, the main properties of biodiesel such as the pH number, calorific value, viscosity, density, flash point and fire point were studied using standard methods. Three replications were done for all the tests, and their means were calculated.

Combustion Properties

Combustion Properties of different blends

BLENDS	FLASH POINT (K)	FIRE POINT (K)	CALORIFIC VALUE (MJ/kg)
DIESEL	343	353	45.5
B10	326	333	45.418
B20	323	330	45.380

From the above tabular column diesel has the highest combustion properties as compared to B10 and B20, but the values of B10 and B20 are not significantly low.

Physical Properties of different blends

BLENDS	VISCOSITY (cm²/sec)	DENSITY (Kg/cm³)
DIESEL	2.3	815
B10	2.89	842.7
B20	2.92	859.122

It is evident from the table that diesel has lower viscosity and density compared to the biofuel blends.

Chemical Properties

BLENDS	pH NUMBER
DIESEL	5.5-8
B10	5.3-8.7
B20	5.2-8.5

Chemical Properties of different blends
It is visible B20 is acidic compared to B10 and diesel.

IV.   CONCLUSION

It was observed that with increase in blend percentage of rapeseed oil with diesel, the calorific value of the mixture does not vary adversely and the flash and fire point of the mixture reduces significantly, hence facilitating the ignition of the fuel to take place at lower temperatures. Further studies were conducted on physical properties, the

parameters which were considered were Viscosity and Density. It was observed that viscosity and density increase with increase in blend quantity. We also note that an increase in viscosity produces a detrimental effect on the performance of the engine however an increase in density of the fuel will further reduce the volume occupied by the fuel thus enabling us to optimize the storage capacity of the fuel tank.

With the depletion of fossil fuels, it is important that we develop alternative fuels and technologies that will enable us to reduce the carbon footprints and move towards the greener future. This project aims at contributing to this cause through the blending of organic oil with diesel to produce a petroleum hybrid. In this study we worked with different blends of rapeseed based biodiesel and the results can be used to increase the efficiency of the fuel and reduce the emission characteristics. Using this biodiesel engine performance can be obtained through various tests. Therefore, to summarize it is observed that biodiesel fuel tend to improve the overall properties of fuel.

ACKNOWLEDGMENT

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DESIGN AND ANALYSIS OF OD CHAMFERING MACHINEWHEEL ASSEMBLY FOR HELICAL SPRINGS

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ABSTRACT

The main objective of this paper is to deliver information about an automated & system integrated machine named as 'Spring OD Chamfering Machine' with the help of the data obtained by through research and development techniques. This paper mainly fuscous on the one of the main sub assembly of this machine named chamfering wheel assembly. This subsequent machine contributes to the precise delivery of sophisticated chamfering operation performed on a helical compression spring, which is primarily used in automotive industries. The accuracy and tolerance of this new machine has increased when compared to the old machine, the materials used for the manufacture has changed. The grinding wheel's length has increased, and the grinding wheel's material has also changed. This prescriptive paper offers genuine concepts & overview of the research and development done on the respective machine along with the basic introduction about the same. The machine has the huge scope for development as it is being an automated & system integrated machine and the same has been portrayed in the following paper.

Keywords: Automated & system integrated, Helical spring, Chamfering Machine, Chamfering wheel assembly, OD-outer diameter.

I. INTRODUCTION

For many machine manufacturers, automated chamfering is a reliable option. The automated machines still require operators, but there is a drastic reduction in the intensive labor and time required to do the job, thus reducing overhead and increasing efficiency. Skilled chamfering laborers can and will manually do an excellent job of chamfering. However, in the spring chamfering production, the automated chamfering machines provide greater consistency. This Chamfering machines can also provide more accurately a product that meets the specifications. These operations can be carried out in a variety of ways depending on the type of machine and set-up. It is possible to use a small face mill, a long edge cutter, an end mill or chamfer cutter. A grinding dresser or wheel dresser is a tool for dressing the surface of a grinding wheel (that is, slightly trimming).[8] Grinding dressers are used to restore a wheel to its original round shape (that is, to make it true), to expose fresh grains to renewed cutting action (including cleaning off clogged areas), or to make a different profile (cross-sectional shape) on the edge of the wheel.It can produce very fine finishes and very precise dimensions; however, it can rough out large volumes of metal quite quickly in mass production contexts. Usually it is better suited to machining very hard materials than "regular" machining (i.e. Cutting larger chips with cutting tools such as tool bits or milling cutters), and it was the only practical way to machine materials such as hardened steels until recent decades.[20] With the change of grinding depth, grinding area and positive pressure between spring and wheel change in the spring end chamfering process. In this way, if the pressure chamfering is adopted, the chamfering force will be inconstant and chamfering efficiency will be

low. To improve chamfering efficiency and chamfering accuracy, the control force chamfering is applied with constant chamfering force. This chamfering method is good for the low-rigidity chamfering system. According to the spring end chamfering process, this paper deduces the chamfering force of spring end chamfering theoretically, and analyses the relationship of the chamfering force with the chamfering feed and depth.Types of springs: Helical compression springs, helical extension springs, conical springs, Torsion springs, Belleville springs

[21] Helical compression springs:Made from round wire and wrapped in cylindrical form with a fixed pitch. Plain end-least expensive, tends to bow sideways under load. Plain and ground end-Better mating conditions being flat,likely to get entangled in storage, Squared end, Squared and ground end.

Fig. 1: Un-chamfered and chamfered springs

II. OBJECTIVE

There are many ways to chamfer the outer diameter of the helical spring. But the main objective of this machine to provide chamfering operation on the helical spring 'simultaneously' on it's both ends. The helical springs used in the automotive industries are not necessarily of same sizes i.e. they may have different diameters and lengths as per the required application. Imagine the exhaustive work if the operator were to perform the operation manually on all such varying size helical spring.To perform such simultaneous &effective chamfering on helical spring with all such variations, hence the need of automated & system integrated machine.[3]The purpose of spring end chamfering is to correct the verticality of spring and the parallelism of both spring ends, and to make spring ends and other components in close contact, and to improve the service life of compression spring by uniform

pressure. [1] The requirements of the spring end chamfering describe as follows the chamfering angle is 45°; the thickness of the end needs to be not less than 1/8 of the spring wire diameter(1/4 is the best).[2] Spring end chamfering belongs to face grinding, and the characteristic of the spring determines unique grinding process.

III. NEED FOR SIMULTANEOUS OPERATION

- ➢ Enhancing chamfer quality.
- ➢ To reduce the operating time required.
- ➢ To reduce the operator's fatigue.
- ➢ To increase the industry's productivity.
- ➢ To reduce the labour.

IV. SPRING OD CHAMFERING MACHINE

Some of the main assemblies and parts are:

1. Chamfering wheel assembly.
2. Spring guiding assembly.
3. Spring pressure pad assembly.
4. Conveyor belt assembly.
5. Two base plates.
6. Base frame.
7. Two motors in grinding wheel assembly.
8. One motor in conveyor belt assembly with reduction gear box.
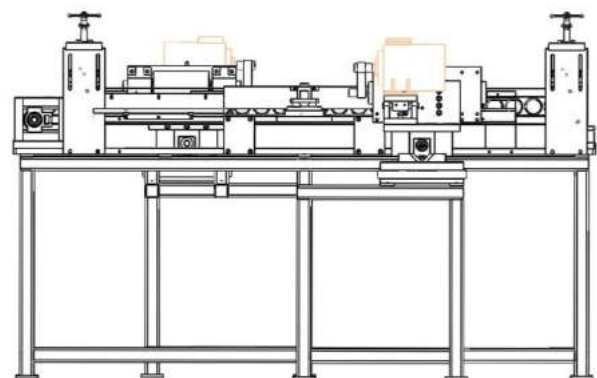
Fig. 2: Concept drawing of OD Chamfer machine

V. DESIGN OF CHAMFERING WHEEL ASSEMBLY

The chamfering wheel assembly is the main assembly in spring OD chamfering machine. This assembly performs the chamfering operation, as the shaft rotates at 3000rpm which in turn rotates the grinding wheel and as the spring comes in contact with wheel the material removal takes place.

Table 1: Chamfering wheel assembly parts

SL NO.	DESCRIPTION	QUANTITY
1	HOLDINGPLATE	1
2	WHEEL BACK PLATE	2
3	LOCK NUT-L	1
4	WHEEL SPACER	1
5	WHEEL SPACER	1
6	WHEEL SIDE SPACER	1
7	WHEEL SIDE SPACER-1	1
8	CHAMFERING WHEEL	1
9	MOTOR PULLEY	1
10	SPINDLE/SHAFT	1
11	PLUMBER BLOCK	2
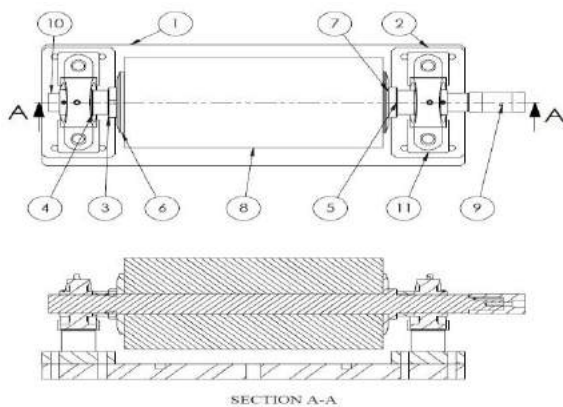
Fig. 3: Chamfering wheel assembly

Wheel assembly drawing.

1. Wheel shaft
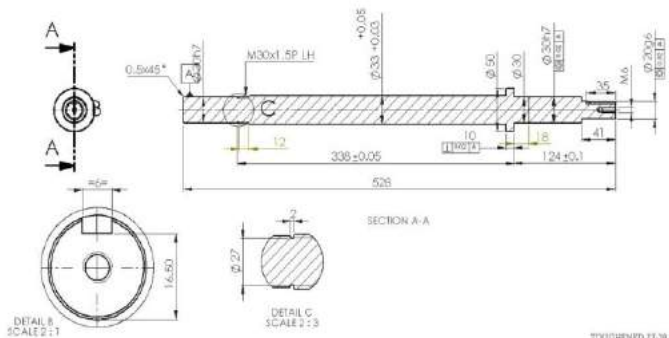
Fig. 4: Chamfering wheel shaft drawing

The chamfering wheel shaft is made up of 90MnCr material and it is hardened to 50-55 HRC, tolerance has to be maintained in ordered to get a good fit. The shaft must be zinc iron coating (trivalent yellow) and the burrs must be removed.

2. Chamfering wheel
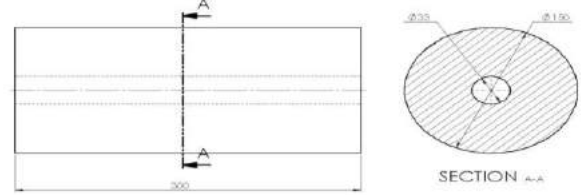
Fig. 5: Chamfering wheel drawing

The chamfering wheel is the important part in the chamfering wheel assembly, as the length of the chamfering wheel increases the chamfering quality increases but it results in more weight on shaft. Coarse grit size is used for more material removal at fast rate whereas fine grit size is used for less material removal but good surface finish at slow rate.

3. Shaft support
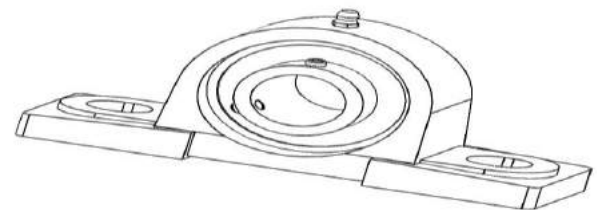
Fig. 6: Shaft support plumber block

In the older machines instead of the plumber block the manufactured support block were used, which used to get worn out quickly.[22] The life span of the plumber block is more compared than the manufactured support block and lubrication in the plumber block is easy.
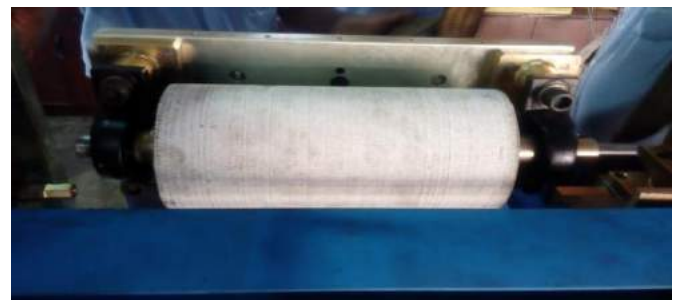
Fig. 7. Chamfering wheel assembly mounted on machine

VI. ANALYSIS OF CHAMFERING WHEEL ASSEMBLY

Mass properties of wheel assembly:

Mass = 25.31 kg

Volume = 9181043.72 mm³

Surface area = 767046.39 mm²

Table 2: Center of mass

Centre of mass (mm)	
X	= -1.19
Y	= 27.23
Z	= -0.52

Table 3:Principal axes of inertia and principal moments of inertia

Principal axes of inertia and principal moments of inertia: (kg*mm²)	
Taken at the center of mass.	
Ix = (0.00, 0.00, 1.00)	Px = 136516.98
Iy = (0.96, -0.30, 0.00)	Py = 531718.53
Iz = (0.30, 0.96, 0.00)	Pz = 541019.39

Table 4: Moments of inertia at the center of mass

Moments of inertia:(kg*mm²)		
Taken at the center of mass and aligned with the output coordinate system.		
Lxx = 532530.03	Lxy = -2624.87	Lxz = 50.68
Lyx = -2624.87	Lyy = 540204.85	Lyz = -1106.28
Lzx = 50.68	Lzy = -1106.28	Lzz = 136520.02

Table 5: Moments of inertia at the output coordinate system

Moments of inertia: (kilograms * square millimeters)		
Taken at the output coordinate system.		
Ixx = 551299.97	Ixy = -3447.80	Ixz = 66.36
Iyx = -3447.80	Iyy = 540247.75	Iyz = -1463.72
Izx = 66.36	Izy = -1463.72	Izz = 155319.25

B. Units maintained

Table 6: Units maintained for design of components

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

C. Material properties

Table 7: Material properties of chamfering wheel assembly

Model reference	Properties	
	Name:	Plain Carbon Steel
	Model type:	Linear Elastic Isotropic
	Default failure criterion:	Unknown
	Yield strength:	2.20594e+008N/m^2
	Tensile strength:	3.99826e+008N/m^2
	Elastic modulus:	2.1e+011 N/m^2
	Poisson'sratio:	0.28
	Mass density:	7800 kg/m^3
	Shear modulus:	7.9e+010 N/m^2
	Thermal expansion coefficient:	1.3e-005 /Kelvin
	Name:	PBT General Purpose
	Model type:	Linear Elastic Isotropic
	Default failure criterion:	Unknown
	Tensile strength:	5.65e+007 N/m^2
	Elastic modulus:	1.93e+009 N/m^2
	Poisson's ratio:	0.3902
	Mass density:	1300 kg/m^3
	Shear modulus:	6.902e+008N/m^2
	Name:	1.2842 (90MnCrV8)
	Model type:	Linear Elastic Isotropic
	Default failure criterion:	Unknown
	Yield strength:	1.75e+009 N/m^2
	Tensile strength:	1.93e+009 N/m^2
	Elastic modulus:	2.1e+011 N/m^2
	Poisson's ratio:	0.28
	Mass density:	7610 kg/m^3
	Shear modulus:	7.9e+010 N/m^2

Table 8: Loads applied

Load name	Load Image	Load Details
Force-1		Entities: 1 face(s) Reference: Edge< 1 > Type: Apply force Values: 10 N
Torque-1		Entities: 19 face(s) Reference: Face< 1 > Type: Apply torque Value: 2.5 N.m

Table 9: Fixtures

Fixture name	Fixture Image	Fixture Details
Fixed-1		Entities: 1 face(s) Type: Fixed Geometry

E. Meshing details

Table 10: Meshing details

Mesh type	Solid Mesh
Mesher Used:	Standard mesh
Automatic Transition:	Off
Include Mesh Auto Loops:	Off

Jacobian points	4 Points		
Element Size	20.9427 mm		
Tolerance	1.04713 mm		
Mesh Quality	High		
Remesh failed parts with incompatible mesh	Off		
Total Nodes	141174		
Total Elements	88131		
Maximum Aspect Ratio	52.251		
% of elements with Aspect Ratio < 3	93.7		
% of elements with Aspect Ratio > 10	0.505		
% of distorted elements(Jacobian)	0		
Time to complete mesh(hh;mm;ss):	00:00:12		

F. Resultant

Table 11: Resultant

Components	X	Y	Z	Resultant
Reaction force(N)	0.283819	0.903862	-0.00026321	0.947376
Reaction Moment(N.m)	0	0	0	0

G. Study results

Table 12: Stress results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	0 N/m^2 Node: 17814	302728 N/m^2 Node: 53677

Fig. 8: Chamfering wheel assembly 1-Static 2-Stress-Stress1

Table 13: Displacement results

Name	Type	Min	Max
Displacement 1	URES: Resultant Displacement	0 N/m^2 Node: 17814	0.00039736 mm Node: 14997

Fig. 9: Chamfering wheel assembly 1-Static 2-Displacement-Diasplacement1

Table 14: Strain results

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	0 Element: 10498	3.52513e-006 Element: 7830
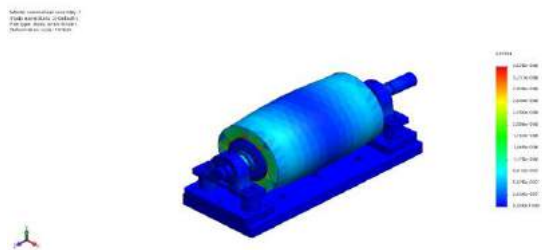
Fig. 10: Chamfering wheel assembly 1-Static 2-Strain-Strain1

VII. CONCLUSION

From all the research, development and their implementation, it can be concluded that the precise and simultaneous chamfering operation on the helical compression springs is achieved successfully by the automated & system integrated machine. The variations in the size of springs can easily be compensated but the key feature of such automated machine is that, the variations in the chamfer are also compensated without any hassle. These springs are used in very high quantity throughout all the various automotive industries. Hence, there is rapidly growing market for this machine in near future. This unique machine can also be used along with sensors and spring feeders to achieve complete

automatic loading of jobs on the conveyor and hence, the objective of this project is thus fulfilled.

Summarizing the literature study, The process of chamfering the helical compression spring will be maximum if the length of the chamfering wheel is more and the abrasive bond must be good. Coarse grit size is used for more material removal at fast rate whereas fine grit size is used for less material removal but good surface finish. Hardening the rotating parts like shaft increases the life by reducing the wear and the material selection must be made based on the parts operation in the machine, using plumber block instead of the manufactured support block which results in high efficiency and less wear.

Most machine-related injuries can be prevented completely. To keep your workplace safe and avoid expensive injuries and lawsuits, providing proper training to all employees before operating any machinery or guards and maintain regular maintenance and repairs. Instruct employees never to remove machine guards during machine operation.

VIII. FUTURE SCOPE

This completely automated & system integrated machine once developed has a lot of scope for the future development when it comes to automating the entire manufacturing line in the industry. With the help of job feeding mechanisms, job carryout mechanisms & different sensors, the machine can be effectively used in any kind of chamfering operation on all different sized jobs. By providing some external & internal Poka-Yoke, machine may not need any operator to provide attention and hence, ultimately the productivity & quality of manufacturing will be drastically improved.

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TREATMENT OF WATER SOLUBLE CUTTING FLUIDS USING MEMBRANE FILTRATION

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ABSTRACT

Metal cutting generates heat due to friction and energy lost deforming the material. The surrounding air has low thermal conductivity (conducts heat poorly) meaning it is a poor coolant. Ambient air cooling is sometimes adequate for light cuts and low duty cycles typical of maintenance, repair and operations. Production work requires heavy cutting over long time periods and typically produces more heat than air cooling can remove. Rather than pausing production while the tool cools, using liquid coolant removes significantly more heat more rapidly, and can also speed cutting and reduce friction and tool wear. Hence water soluble cutting fluid is used in this process to reduce friction, heat and to cool tool- work interface. The main problem with water-soluble coolants is that they become contaminated with use and have to be replaced with new ones, thus yielding waste coolant. However, cutting fluids and metal chips result in environmental pollution and are harmful to the human body. So in order control environmental and harmful effect of cutting fluids on the humans, a membrane filtration system integrated with antibacterial layers is preset to the machine to treat the cutting fluids for removal of metal chips, swarf, lubricants and biological contaminants as it passes through the membranes. The cutting fluid is tested to determine parameters such as pH, concentration of fluid, temperature, corrosion and bacterial contamination of water soluble cutting fluid with and without the filtration system to check the effectiveness with respect to cooling and lubricating properties, its degradation effects on tool and work piece thereby reducing the environmental pollution and harmful effects on workers during use and disposal.

Keywords : Water Treatment, Environment, Pollution

I. INTRODUCTION

[1] During machining process, friction between workpiece - cutting tool and cutting tool- chip interfaces cause high temperature on cutting tool. The effect of this generated heat decreases tool life, increases surface roughness and decreases the dimensional sensitiveness of workmaterial. During metal cutting heat generated as a result of work done .Heat is carried away from the tool and work by means of cutting fluids, which at the same time

[2] reduced the friction between the tool and chip and between tool and work and facilitates the chip formation. Cutting fluids usually in the form of a liquid are to the formation zone to improve the cutting condition. The application of cutting fluids is another alternative to obtain higher material removal rates.

Cutting fluids have been used widespread in all machining processes. However, because of their damaging influences on the environment, their applications have been limited in machining processes. Cost effectiveness of all machining processes has been eagerly investigated. This is mainly affected selection of suitable machining parameters like cutting speed, feed rate and depth of cut according to cutting tool and workpiece material. The selection of optimum machining parameters will result in longer tool life, better surface finish and higher material removal rate.

II. OBJECTIVES

The main problem with water-soluble coolants is that they become contaminated with use and have to be replaced with new ones.

- Cutting fluids and metal chips result in environmental pollution and are harmful to the human body
- To improve environmental and harmful effect of cutting fluids on the humans, a membrane filtration system integrated with antibacterial layers is preset to the machine
- It is used to treat the cutting fluids for removal of metal chips, swarf, lubricants and biological contaminants as it passes through the membranes.
- The cutting fluid is tested to determine parameters such as pH, concentration of fluid, temperature, corrosion and bacterial contamination of water soluble cutting fluid with and without the filtration system to check the effectiveness with respect to cooling and lubricating properties
- Its degradation effects on tool and work piece thereby reducing the environmental pollution and harmful effects on workers during use and disposal.

II. LITERATURE REVIEW

Choon-Man Lee, Young-Ho Choi, Jae-Hyeon Ha, and Wan- Sik Woo[1] In this research it mainly aims Recycling of Cutting Fluids and Metal Chips. Mainly to protect environment eco – friendly technologies were developed. Cutting fluid helps to decrease heat between tool and workpiece interface. It increases tool life and productivity by cooling. Elzbieta Rogos, Andrzej Urbanski[2] In this research it mainly aim in a device and a method for recycling emulsion cutting fluids waste emulsion fluids that has been used in subtractive steel machining were subjected to test after coagulation, barrier filtration, adsorption, and aeration methods. Janja Križan, Arnela Muri, Irena Petrinic, and Marjana Simonic[3] they stated that how to treat membrane treatment of spent cutting-oil before disposal. They needed to be treated before disposal because of losing of their functional properties. The main disadvantage of membrane is that there is particle accumulation in pores of membrane that they don't allow cutting fluid to pass through. Kenji Yamaguchi, Yasuo Kondo, Satoshi Sakamoto,Mitsugu Yamaguchi and Ryoichi Nakazawa[4] they have investigated on recycling of amine-free water-soluble coolant. In this process basically three steps were carried. First they have done execution by separating oil from coolant by using surfactant treatment and second they have done separation of tramp oil process. Contaminant oil is isolated and removed by gravity separation. Third step is filtration. The recycling of amine is done in 3 axis machine then they have observed pH, corrosion, cooling performance because of this advantageous result to use it in water soluble coolant. Karolina dziosa[5] he investigated on analysis of the possibility of used coolant regeneration. In this used coolant contains solid particles, chemical products and

elements of cooling system. It could be recovered by using hybrid membrane techniques. They have determined pH,corrosion, bacterial contaminant. Frederick J. Passman[6] he has discussed regarding types of microorganisms contaminate present in metalworking fluids. Metalworking fluid spoilage can be defined as any change in the fluid that adversely affects its utility. Four factor that dominate in controlling microbial life are energy source, nutrients and acceptable thermal and pH conditions. Metal working fluid keeps on changing due to physical, chemical and microbiological activity.

IV. METHODOLGY

Work flow model right from selection of water soluble cutting fluid to Comparison of cutting fluid with and without the system is shown in flowchart as given below as follows.
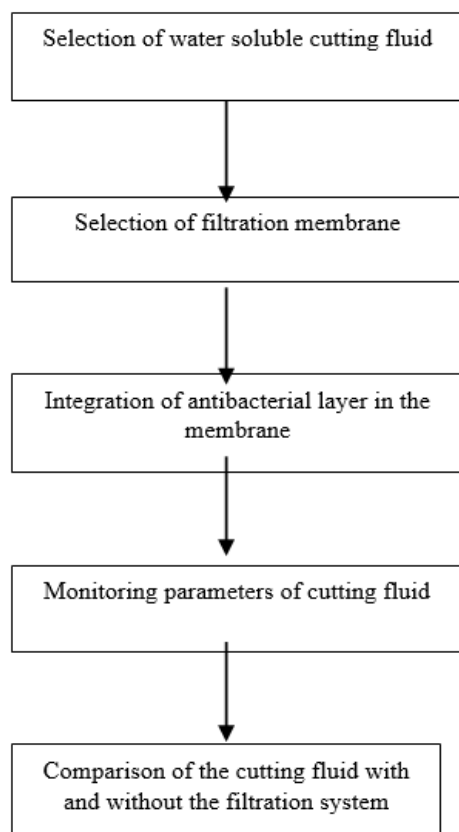
V. RESULTS

The cutting fluid is tested to determine parameters such as pH, concentration of fluid, temperature, corrosion and bacterial contamination of water soluble cutting fluid with and without the filtration system to check the effectiveness with respect to cooling and lubricating properties

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Studies on Predictive Maintenance System for Automotive Braking Using Artificial Intelligence Techniques

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ABSTRACT

In automobile, brake system is an essential part responsible for control of the vehicle. Any failure in the brake system impacts the vehicle's motion. It will generate frequent catastrophic effects on the vehicle cum passenger's safety. Thus the brake system plays a vital role in an automobile and hence condition monitoring of the brake system is essential. Vibration based condition monitoring using machine learning techniques are gaining momentum. This study is one of attempt to formulate an approach & methodology for identifying predictive maintenance requirements of hydraulic brake system. In this research, the various condition based monitoring algorithm will be studied & compared. A detailed study will be performed on Clonal Selection Classification Algorithm (CSCA) improvement and practical application. A hydraulic brake system test rig will be fabricated. Under good and faulty conditions of a brake system, the various signals will be acquired. The statistical parameters will be extracted from the signal. Base algorithm will be established based on the maximum accuracy for the fault diagnosis of a hydraulic brake system. An attempt will be made to develop self-learning model, in order to fine tune base algorithm based on driving conditions & patterns. The Digital Twin of hydraulic brake system will be developed. The On-Board Diagnostic (OBD) data will be used to test & validate the Digital Twin. Finally a predictive maintenance application will be developed to alert driver on current health of brake system & upcoming maintenance requirements.

Keywords: Millennials, Talent Management, Retention, Retention Strategies.

I. INTRODUCTION

Brakes are the most important control components in automobile. Every automobile shall be equipped with an efficient brake system which ensures the stability of the vehicle. An efficient brake system should bring the vehicle to rest within a reasonable distance. The brake system must promote the highest degree of safety on the road not alone for the person driving but also for the others moving on the road. Since there are moving components involved, they are bound to get faulty due to various reasons, viz. wearing, air leak, fade, etc. When such things occur, the effectiveness of the brake system reduces resulting in accidents. It is essential that the brake system and brake components should be monitored all the time and diagnosed when faults occur. Hence maintenance of the brake system plays a vital role in terms of safety.

The malfunction of the brake system can be identified through its symptoms or some warning sign; since the faults in the brake system are not fairly noticeable. Monitoring of a brake system is not an easy job. This can be performed using intelligent techniques called fault diagnosis through machine learning. Such analysis will provide the information required to make a

decision about when intervention is required for maintenance. The results of such analysis can be used for failure analysis in order to determine the original cause of the fault. Combining these results with engineering and manufacturing data of brake system, can be used to predict the health of brake system & identify the maintenance needs.

II. PROBLEM STATEMENT

In many industries inclusive of automotive vehicle industry, predictive maintenance has become more important. It is hard to diagnose failure in advance in the vehicle industry because of the limited availability of sensors and some of the designing exertions. The research in predictive maintenance and prognostics in the automotive industry is small. In particular to Braking System, only a few different methods have been presented so far with no or limited practical application. Thereby, industry is lacking a proven approach & robust methodology to develop predictive maintenance systems for braking system.

III. LITERATURE SURVEY

Following is the partial list of relevant literature to justify research on this topic.

From the literature one can understand that many algorithms have been used for classifying the faults in various machine elements. In order to suggest strongly that a particular algorithm is better, a detailed study needs to be conducted. One such detailed study [1] suggests that the Clonal Selection Classification Algorithm (CSCA) performs better and gives the maximum classification accuracy (96%) for the fault diagnosis of a hydraulic brake system. From the study, one can confidently say that CSC algorithms were found to be good contender and it can be used for practical applications of fault diagnosis of the hydraulic brake system. Hence, a further research work is required to improve classification accuracy of CSCA for practical applications.

To model the fault diagnosis problem as a machine learning problem, a large number of vibration signals are required for each condition considered for study. It may be possible to acquire any number of vibration signals for good condition; however, it is very difficult to acquire signals of different faulty conditions. A detailed study [2] had been performed to determine minimum sample size. This study can be leveraged to determine # of training data set for base algorithm.

There are serious challenges when we deal with prognostic maintenance. Prognostic maintenance copes with onboard data. Development cost of on-board diagnostic is limited in vehicle, which results in limited number of sensors. These sensors produce thousands of signals or data streams when vehicle is on the move. With the increasing trend of smart phones and wireless communication, it has become feasible to use these technologies for real time solutions. Despite limited resources, these technologies are being used along with machine learning approaches to solve big problems in automotive industry. A novel vehicle monitoring and fault predicting system is presented in this paper [3] including VMMS. A further research is needed for practical application.

The research in predictive maintenance and prognostics using on-board data streams in the automotive industry is small. Only a few different methods have so far been presented. Two approaches to predict vehicle maintenance is put forward in this thesis [4]. The first one, presents an unsupervised self-learning method for predictive maintenance based on streaming on-board data. It specifically aims at tackling the bottleneck of manually crafted predictive algorithms by using life-long learning of upcoming failures. The second approach relies on off-board data sources for maintenance predictions and uses supervised classification to predict the future maintenance of vehicles. Notably, no method is found which utilises both historical and real-time

data, and this leaves room for further research in this area.

IV. METHODOLOGY

This study will adopt Digital Twin based methodology and attempt to design, develop and validate Digital Twin (Fig 1.0) for hydraulic brake system.
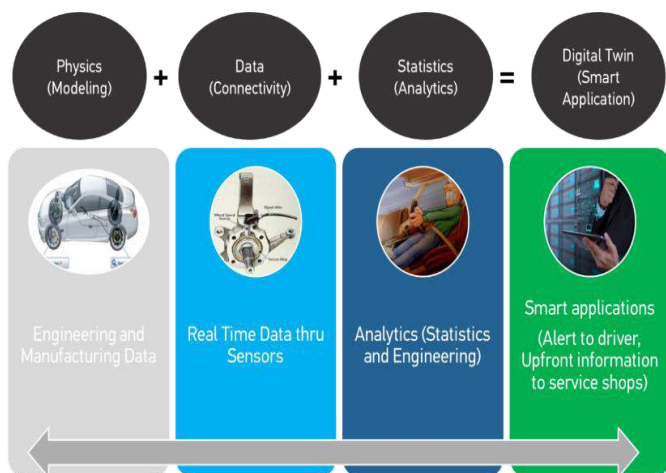
Fig: Digital Twin: Preliminary Architecture

Below section describe the preliminary steps to follow:

Comparative Study of Condition Based Monitoring (CBM) Algorithms

Detailed Study of CSCA & Establish Improvement Approach

Define Data Acquisition System Architecture and Analysis Approach

Learn from Offboard/Historic Data

Setup System Test Infrastructure

Establish Base Algorithm via Supervised Learning Techniques

Learn from Onboard Diagnostic

Deploy Edge Analytics

Fine Tuning of Base Algorithm via Unsupervised Learning Techniques

Design, Develop and Validate Digital Twin for Test Rig

Generalization of Digital Twin for Hydraulic Brake System

Develop & Validate Application to Predict Maintenance Requirement

Conclude Approach and Methodology to identify predictive maintenance requirements for Brake System

V. EXPECTED OUTCOME OF THE RESEARCH

As a result of this study, an approach & methodology will be established, which will enable predictability (>99.999%) in identification of maintenance requirements for hydraulic brake system.

VI. CONCLUSION

In many industries inclusive of automotive vehicle industry, predictive maintenance has become more important. It is hard to diagnose failure in advance in the vehicle industry because of the limited availability of sensors and some of the designing exertions. However with the great development in automotive industry, it looks feasible today to analyze sensor's data along with machine learning techniques for failure prediction. In this study, an approach & methodology will be developed for predictive maintenance of hydraulic brake system with the end goal of expanding vehicle up-time and safety on-the-road.

ACKNOWLEDGMENT

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Performance Analysis of Fixed and Tracking Flat Plate Collectors

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ABSTRACT

This paper focuses on Thermal efficiency analysis of flat plate collectors. The instantaneous efficiency for a collector over a day is calculated. Application of solar energy for domestic and industrial heating purposes has been become very popular. However the effectiveness of presently used fixed flat plate collectors is low due to the moving nature of the energy source. In the present work, an attempt has been made to compare the performance of fixed flat plate water heater with that of heater with tracking by conducting experiments. A flat plate water heater, which is commercially available with a capacity of 100liters/day is instrumented and developed into a test-rig to conduct the experimental work. The analysis is carried during which the atmospheric conditions were almost uniform and data was collected both for fixed and tracked conditions of the flat plate collector. The results show that there is an average increase of 400C in the outlet temperature. The efficiency of both the conditions is calculated and the comparison shows that there is an increase of about 21% in the percentage of efficiency.

Keywords: Flat Plate, Energy Source, Water Heater

I. INTRODUCTION

Solar energy is the energy from the sun. The sun radiates an enormous amount of energy in the form of heat and light resulting from nuclear fusion reaction in its core. Some Solar systems utilises heat energy for heating and others converts sunlight energy into electrical energy. Solar energy is a renewable energy source and inexhaustible in nature. Only a small part of the solar energy that the sun radiates into space ever reaches the earth, but that is more than enough to supply all our energy needs. The sun constantly delivers 1.36 kW of power per square meter to the earth. Solar energy is mainly used to heat buildings and water and to generate electricity. The major component unique to passive systems is the Flat plate collector. This device absorbs the incoming solar radiation, converting it into heat at the absorbing surface, and transfers this heat to a fluid (water) flowing through the Flat plate collector.

The warmed fluid carries the heat either directly to the hot water or to a storage subsystem from which can be drawn for use at night and on cloudy days. There are different type of solar collectors like flat-plate collectors, Focusing type collector and evacuated type collector.

II. FLAT PLATE COLLECTORS

The main components of a flat plate solar collector are:

- **Absorber plate** made of copper material, which is black coated to absorb maximum sun radiations falling on it
- **Tubes or fins** for conducting or directing the heat transfer fluid from the inlet header or duct to the outlet.
- **Glazing**, this may be one or more sheets of glass or a diathermanous (radiation transmitting) plastic film or sheet.
- **Thermal insulation**, which minimizes

downward heat loss from the plate.

- **Cover strip**, to hold the other components in position and make it all Watertight.
- **Container or Casing**, which surrounds the foregoing components and keeps them free From dust, moisture, etc
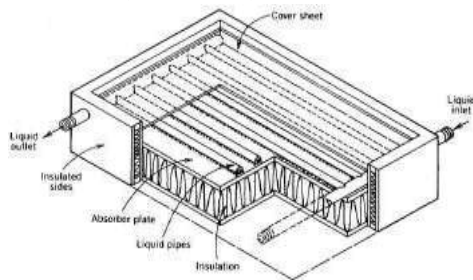
Figure 1 Components of a flat plate solar collector

III. THE DESIGN PROCEDURE OF FLAT PLATE COLLECTORS

1) TECHNICAL SPECIFICATIONS

Collector specifications:-

- Solar frame : Width 93mm thickness 1.2mm with powder coating.
- Back sheet : Aluminum sheet 0.45 mm.
- Insulation : Fiber glass wool 25mm thick 18kg density.
- Fins : 9 fins of 56mm, 1/2 inch copper pipe, 0.12mm copper Sheet with black coating ultrasonic weld.
- Front glazing : Toughened glass 4mm thick.
- Bonding between Riser And Absorber sheet : Continuous ultrasonic welding.
- Assembly : assembled under pneumatic technology.
- Bonding between Riser And Header : Brazing
- Aluminum foil : 0.05 mm
- Gromets : EPDM
- Packing : Corrugated sheet
- Collector size : 1030mm X 2030mm
- Collector beading : EPDM Rubber beeding Storage tank specifications
  - Storage tank : Stainless steel 304 Grade.
  - Insulation : Rockwool / Min / puff.
  - Tank outer cladding : Powder coated sheet / Stainless steel.

- Inter connecting pipes : Stainless steel 304 Grade.
- Electrical backup : 2 KW thermostats controlled
- Storage tank stand & Hose pipe: Mild steel & 25/35 EPDM Rubber

IV. TESTING OF FLAT PLATE COLLECTORS

For the testing of solar collectors there are two basic procedures, the instantaneous procedures and the calorimetric procedure. Each of these two procedures will allow determination of the fundamental characteristics of the collector. The most widely used procedure for testing collectors is the instantaneous procedure. In this procedure it is only necessary to measure simultaneously under steady state conditions the mass flow rate of the working fluid through the collector, the fluid temperature rise between the collector inlet and outlet, and the isolation on the plane of the collector. The instantaneous efficiency can then be calculated from the following expressions.

$\eta i = Q/ (AP \times I_T)$
Where,

ηi = Instantaneous efficiency AP

= Area of the collector Plate I_T

= Radiation on tilted surface
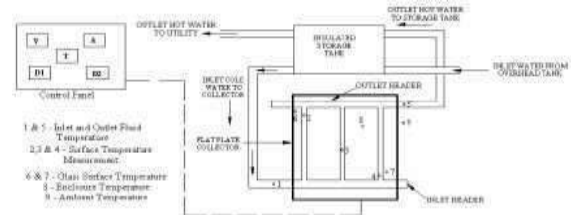
Figure 2.Experimental Setup
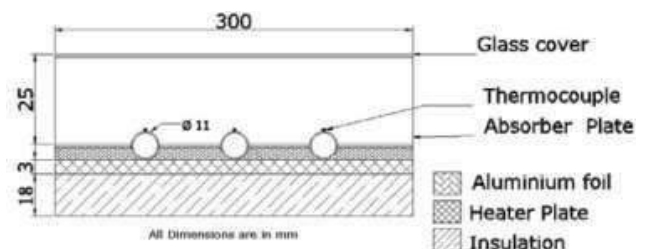
Figure 3. Cross sectional view of the experiment setup

Calculation of Instantaneous Efficiency Observations

Constant Terms:-

- Length of the absorber plate 'L' = 2.03 m
- Breadth of absorber plate 'B' = 1.03 m
- I.S.T (Indian standard time)
  When reading was taken = 11.00 Hrs
- Location of Bangalore = 77.59 ºE ,12.96 ºN
- I.S.T Longitude = 82.5º E
- Date on which the
- Experiment was conducted = 2nd November 2010
- Collector is facing due south
- Mass flow rate = 0.5 LPM

Variable Terms:-

- Inlet temperature of water = 27º C
- Outlet temperature of water = 42º C
- Angle of tilt = 60º C

Sl no	I.S.T hours	Temperature of the inlet fluid T_i	Temperature of the outlet fluid T_o
1	8.00	24	25
2	9.00	24	29
3	10.00	26	35
4	11.00	27	42
5	12.00	27	45
6	13.00	28	48
7	14.00	28	45
8	15.00	30	40
9	16.00	29	35
10	17.00	28	31

Table 1. Observation of Test Set up

Calculations

Trial 1 – 11 AM a)Incident angle θ:-

$Cos\theta = \cos(\Phi - \beta)\cos\omega\cos\delta + \sin(\Phi - \beta)\sin\delta$ Here,

$\Phi = 12.96$º for Bangalore

δ = Declination angle = 23.45 sin[360 (284+n) / 365]

Here, n = 336 for december 2

Where,

δ = - 22.11º

ω = Hour angle =15 (12 – LST)

LST = IST – 4 (82.5º - longitude of location) + Equation of time

60

= 11.00 – 4 (82.5º - 77.59º)   + 11'.14"

60

= 11.00 – 20' + 11'.14"

= 10.51 hrs

ω =15 (12.00 – 10'.51") = 16.5º

Substituting all the values in the above equation we get ,

$\cos\theta$ = cos (12.96 º - 60 º) cos(16.5º) cos(-22.1 º) + sin (12.96 º- 60 º) sin(-22.1 º) θ = 28.258 º

b) $\cos\theta Z = \cos\Phi \cos\omega \cos\delta + \sin\Phi \sin\delta$

= cos 12.96 º cos16.5 º cos -22.1 º + sin12.96 º sin -22.1 º θZ = 18.18 º

c)   Rb = $\cos\theta$ / $\cos\theta Z$

= 0.927

d)   Air mass La :- La = 1 / $\cos\theta Z$

La = 1 / cos18.8 º

= 1.05

e)   In = A e - BLa

= 1196 (e – 0.143 X 1.730)

= 1028.1 W/m2

f)   Ib = In ($\cos\theta Z$)

= 977.1 W/m2

Id = 0.105 X 1028.1

= 107.94 W/m2

g)   Ig = Ib + Id

= 977.1 + 107.94

= 1084.94 W/m2

h)   Radiation on tilted surface IT

IT = IbRb + Id(1+ cos β /2) + Ig. ρ(1- cos β /2)

= 977.1(0.927) + 107.94(0.75) + 1084.94(0.6)(0.25)

= 1149.37 W/m2

i)   η = m CP (To – Ti)

$$\frac{AP \; X \; IT =}{2 \; X \; 1149.37} \quad 0.00833 \; X \; 4184 \; (42 - 27)$$

= 22.98 %

Similarly Hourly global radiations and efficiencies are calculated for all the trials up to 17.00 hrs and are tabulated

Sl no	I.S.T Hours	Radiation on tilted surface IT(W/m²)	Thermal efficiency η (%)
1	8.00	669.33	5.2
2	9.00	888.977	9.7
3	10.00	1030.13	15.17
4	11.00	1149.37	22.98
5	12.00	1188.75	26.29

6	13.00	1166.33	30.60
7	14.00	1047.21	28.19
8	15.00	877.41	19.47
9	16.00	687.852	15.14
10	17.00	485.3	10.73

Table 2 Calculated efficiency and global radiation

The average efficiency Over a day is given by η =

$$\frac{\int_0^t m \; CP \; (T_O - T_i) \; dt}{\int_0^t (AP \; X \; IT \; X \; dt)}$$
= 29.11 %

2) Test Procedure

Two identical single cover flat plate collector were placed with an angle at 28º to the horizontal towards south facing. One collector is fixed and other one is tilted manually for every two hours with an angle of 30º for improving collector efficiency. Inlet temperature of the water and temperature of the hot water in the storage tank were tabulated on hourly basis, both the collector efficiency of the collectors were calculated.

Specification of Flat Plate Collector

- Length of the collector = 2m
- Width of the collector = 1m
- Length of the absorber plate = 1.95m
- Width of the absorber plate = 0.95m
- Material of the absorber plate = Copper
- Thermal conductivity of the plate material = 386 W/mK
- Density of the plate material = 8954 kg/m3
- Plate thickness = 34 gauge
- Diameter of the tube = 6.35m
- Tube center to center distance = 100mm
- Number of tubes used = 9
- Glass cover emissivity/absorptivity = 0.85
- Refractive index of glass relative to air = 1.5
- Diameter of header pipes = 12.7mm
- Insulating material used = Glass-wool
- Thermal conductivity of insulating material = 32.2*10.3 W/mK
- Density of insulating material = 200 kg/m3
- Material of collector tray = Mild steel
- Thermal conductivity of collector tray = 53.6 W/mK
- Density of collector tray = 7833 kg/m3

Efficiency Calculation

Average Solar radiation received by earth in terms of energy R = 900 W/m2/Hr. Solar radiation received by earth in 7 hours in terms of energy R = 900*7 W/m2/day R = 6300 Wh/m2

R = 22680000 W Sec/m2, where

A = Area of Flat plate collector in m2

A.   T1 = Temperature of water at inlet in ºC

B.   T2 = Temperature of water at outlet in ºC
Mass of water taken in the storage tank = 100 kg

Specific heat of water = 4.182 KJ/KG ºK Area of the flat plate collector,

A = L*W m2

= 1.95*0.95

= 1.8525 m2

Radiation receive by collector, R1 = R*A

= 22680000*1.8525

= 43014700 Joules

Output of the Stationary Collector Q = M*Cp*(T2 – T1)

= 100*4.187*103*(42 – 22)

= 8374000 Joules

Output of the partially rotating Collector Q = M*Cp*(T2 – T1)

= 100*4.187*103*(46 – 22)

= 10048800 Joules

Efficiency of fixed flat plate collector

η = Output of the collector / Input Radiation η = M*Cp*(T2 – T1) / R*A

= 8374000 Joules / 43014700 Joules

= 19.93%

Efficiency of the partially rotating Collector η = Output of the collector / Input Radiation η = M*Cp*(T2 – T1) / R*A

= 10048800 Joules / 43014700 Joules

= 23.92%

V. RESULT AND DISCUSSIONS

Average global Radiation 878 WH/m2 Average Wind Speed = 5.1 Km/hr

Time in Hours	Outlet temperature collector (T2ºC)	Outlet temperature tracking collector (T2ºC)
9:30	30	30
10:30	33	34
11:30	37	37
12:30	41	42
13:30	44	46
14:30	47	50
15:30	48	52
16:30	48	51
Average Temperature	41	42.75

Average global Radiation 1089 WH/m2 Average Wind Speed = 5.3 Km/hr

Time in Hours	Outlet temperature of stationary collector (T₂°C)	Outlet temperature of tracking collector (T₂°C)
9:30	30	30
10:30	33	34
11:30	37	37
12:30	42	42
13:30	46	46
14:30	48	50
15:30	50	52
16:30	51	55
Average Temperature	42.12	43.25

Table 4 Temperature distribution

COMPARISON OF EFFICIENCIES OF FIXED AND PARTIALLY ROTATING FLAT PLATE COLLECTORS

Efficiency of fixed flat plate Collector	Efficiency of the partially rotating Collector C.	Increase in Percentage of efficiency due to tracking D.
E. 19.93%	23.92%	F. 21%

Table 5 comparison

From the above calculation, we can conclude that by providing the manual tracking system to the collector with respect to solar beam we can improve the efficiency of the system and it can also be concluded that if we provide the continuous automatic tracking system to the collector, in terms of azimuth angle and altitude, we can still improve the efficiency of the system.

VI. VARIATION OF EFFICIENCY OF THE COLLECTOR WITH THERMAL EFFICIENCY
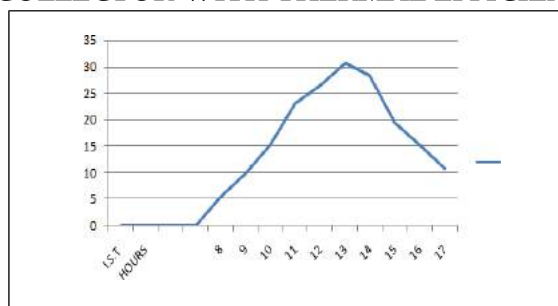
Figure 6.Efficiency versus Time

Figure 6 shows the variation of efficiency of the collector with time .It is evident that the efficiency increases with the time up to 1300 hrs due to the availability of intense beam radiation and slowly decreases during the sunset

VII. VARIATION OF EFFICIENCY WITH THE CALCULATED RADIATION
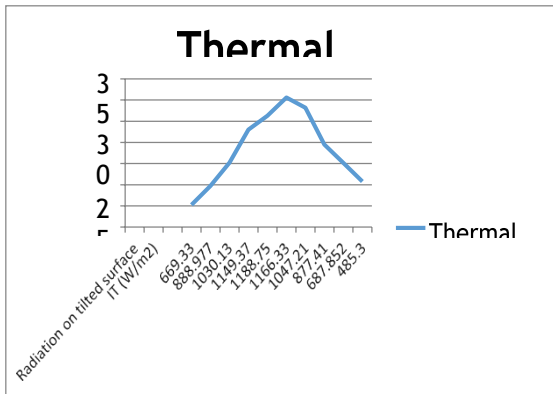
Figure 7.Efficiency versus Tilted radiation

Figure 7 shows the variation of efficiency with the calculated radiation I_T .The curve is similar to the previous one .the maximum radiation corresponding to 1200 hrs.
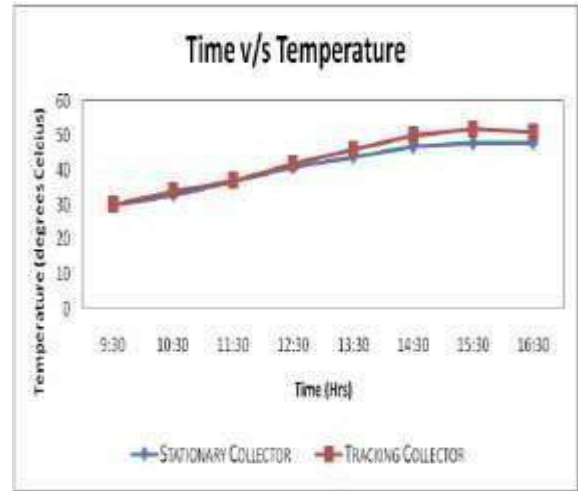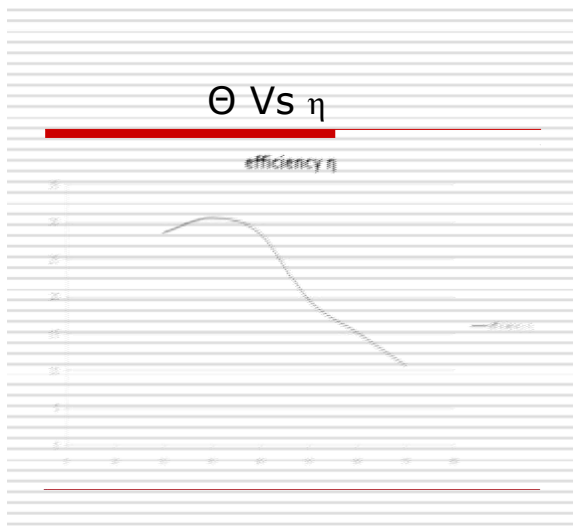
Figure 8 Incident angle θ v/s efficiency

The figure 8 shows the variation of efficiency with incident angle θ and figure 9 shows how temperature varies with respect to time for both stationary collector and tracking collector. The tracking collector utilizes maximum beam radiation. So the rise in temperature is high with respect to time in tracking collector compare to stationary collector and gives higher efficiency

VII. CONCLUSIONS

The Conclusions can be drawn based on the analysis of the collector. The instantaneous efficiency is assumed to be a function of only the temperatures of the fluid and the radiation I_T. A more precise and detailed analysis should include the fact, that the overall heat loss coefficient (U_L) and other factors such as wind are not constants. Initially due to the transient effects the useful energy received is less. Efficiency decreases with increasing angle of incidence. Efficiency decreases with increasing ratio of diffuse to beam radiation.From the above results, it has been found that the system provided with manually tracking has got higher efficiency than the fixed flat plate collector by 21%. Hence Flat plate collector with tracking method utilizes maximum beam radiation and gives high efficiency when compared to fixed flat plate collector.

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Progressive Damage Simulation of a Composite Double Cantilever Beam using Virtual Crack Closure Technique and Cohesive Zone Modeling

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ABSTRACT

Delamination in laminated composite structures usually initiate from discontinuities such as matrix cracks and free edges or from embedded defects due to the manufacturing processes. Therefore, it is important to analyze the progressive growth of delamination in order to predict the performance of a composite structure and to develop reliable and safe designs. Virtual Crack closure Technique (VCCT) is a fracture mechanics approach which is widely used to compute energy release rates. Cohesive Zone Method (CZM) is a progressive event governed by progressive stiffness reduction of the interface between two separating faces which uses bilinear material behavior for interface delamination and these two methods are used to analyze the delamination of multidirectional composite Double Cantilever Beam (DCB) specimen in a Commercial Finite element Package called ABAQUS. The proposed methods are validated with the benchmark results and load-displacement curves are plotted using both the methods. The strain energy release rates are found out using VCCT and a parametric study is performed by varying the crack lengths.

Keywords : Delamination, Virtual Crack closure Technique (VCCT), Cohesive Zone Method (CZM), stiffness, Double Cantilever Beam (DCB)

I. INTRODUCTION

Delamination forms on the interface between the layers in the laminate. The analysis of delamination is commonly divided into the study of the initiation and the analysis of the propagation of an already initiated area. Delamination may form from matrix cracks that grow into the inter-laminar layer or from low-energy impact. De-bonding can also form from production non adhesion along the bond line between two elements and initiate delamination in adjacent laminate layers. Under certain conditions, delaminations or de-bonds can grow when subjected to repeated loading and can cause catastrophic failure when the laminate is loaded in compression.

The Double Cantilever Beam (DCB) is used to access the mode I failure strength of composite laminate with all plies. In this type of failure mode, the load is applied on the cantilever arms and the crack propagates in the direction perpendicular to the applied load. In this case, no shear at the crack tip of delamination exists. Hence, the crack growth is due to the out-of-plane load. For this crack growth, we term as "Mode-I" fracture. When the crack advances, the de-bonding takes place between the interfacial surfaces leading to the fracture, releasing the energy which is resulting in delamination. The energy that is dissipated in this process is coined as strain energy release rate or fracture energy pertaining to the DCB. During this process of crack propagation, the applied load will assist in increasing the energy associated with the cantilever arms and thus succeeds in

attaining an energy level which is equal to or greater than the threshold barrier energy.

The strain energy release mechanism is controlled at least partially by the structural interaction between plies during loading the laminate. Since this interaction can be altered by the kinematics of the crack, the energetic argument provides not only a criterion for crack growth but also for the kinematic effects such as growth stability.

Fig 1: Modes of Failure

Fig 2: Double Cantilever Beam with Load

II. Methodology

This paper evaluates to perform progressive damage simulation of the below mentioned DCB specimens with both unidirectional and multi directional composites by using Virtual Crack Closure Technique (VCCT) and Cohesive Zone Models (CZM)

Fig 3 : Multidirectional Double Cantilever Beam specimen

The Carbon-Epoxy multidirectional composite double cantilever Beam specimen is as shown in the above Fig 3. It has 32 plies having stacking sequence and the delamination is at the 16th ply. For this specimen progressive damage simulation of a Double Cantilever Beam specimen is carried out and the strain energy is evaluated using Virtual Crack Closure Technique method.

Fig 4 : Unidirectional Composite Specimen specification

Fig 5 : Multidirectional composite beam specifications

Table 1: Material Properties of the DCB specimen

Material	Graphite/Epoxy
Young's Modulus in 1st direction	146.9 Gpa
Young's Modulus in 2nd direction	10.6Gpa
Young's Modulus in 3rd direction	10.6Gpa
Poisson's ratio 1-2 direction	0.33
Poisson's ratio 2-3 direction	0.33
Poisson's ratio 3-1 direction	0.33
Shear modulus 1-2 direction	5.45Gpa
Shear modulus 2-3 direction	5.45Gpa
Shear modulus 3-1 direction	3.99Gpa
Stacking Sequence for multidirectional specimen	[30/-30/0/-30/0/30/0$_4$/30/0/-30/0/ 30/30±30/30/0/30/0/-30/0$_4$/-30/0/30/0/30/-30]

Table 2: Material Properties of the unidirectional specimen

Material	Graphite/Epoxy
Young's Modulus in 1st direction	150 Gpa
Young's Modulus in 2nd direction	11 Gpa
Young's Modulus in 3rd direction	11 Gpa

Poissons ratio 1-2 direction	0.25
Poissons ratio 2-3 direction	0.45
Poissons ratio 3-1 direction	0.25
Shear modulus 1-2 direction	6 Gpa
Shear modulus 2-3 direction	3.7 Gpa
Shear modulus 3-1 direction	3.7 Gpa
Mode 1 critical energy release rate G1C	0.352N/mm
Maximum Normal stress σ_c	60 Mpa

Virtual Crack Closure Technique

The virtual crack closure technique (VCCT) is a well-established method for calculating the energy release rate (ERR) when analyzing fracture problems via the finite element method (FEM). The technique is based on the numerical implementation of Irwin's crack closure integral, as first proposed for two-dimensional problems and later extended to three-dimensional problems.. In recent years, the VCCT has gained great popularity for the study of mixed-mode fracture problems, such as the delamination of composite materials and interfacial fracture between dissimilar materials.

VCCT calculates energy release rate G, with the assumption that the energy needed to separate the surface is same as the energy needed to close the same surface area. This technique uses a contact or interfacial elements along a predefined interface of model.

Nevertheless, this type of modeling involves a fracture mechanics technique with large body work. Although the growth criterion is energy release rate, G which is the subject of interest but there are few assumptions that must be accounted for, before proceeding to model. They are

- Number of cracks
- Location of cracks
- Size of cracks

Cohesive Zone Modeling

Cohesive zone (CZ) models have been introduced by Dugdale and Barenblatt and have recently attracted a growing interest in the scientific community to describe failure processes and delamination in particular. Cohesive zones project all damage mechanisms in and around a crack tip on the interface, leading to a constitutive relation, or cohesive zone law, between the traction and opening displacement

As the surfaces (known as cohesive surfaces) separate, traction first increases until a maximum is reached, and then subsequently reduces to zero which results in complete separation. The variation in traction in relation to displacement is plotted on a curve and is called the traction-displacement curve. The area under this curve is equal to the energy needed for separation. CZM maintains continuity conditions mathematically; despite physical separation. It eliminates singularity of stress and limits it to the cohesive strength of the material.

Advantages of Cohesive Zone models are:
1) Interaction between crack faces is automatically incorporated and
2) It can be fitted on experimental data.

Cohesive zone models relate the relative displacement ("opening" Δ) of two associated points of the interface to the force per unit of area ("traction" T) needed for separation. Frequently – but not necessarily – a difference is made between normal (n) and tangential (t) direction, so the cohesive zone law comprises the two relations Tn(Δn) and Tt(Δt).

Cohesive zone laws can be uncoupled or coupled. In an uncoupled cohesive zone law the normal/tangential traction is independent of the tangential/normal opening. In a coupled cohesive zone law, both normal and tangential tractions depend on both the normal and tangential opening displacement. Uncoupled laws are intended to be used when the debonding process occurs under one mode – normal (mode-I) or tangential (mode-II) loading – or is largely dominated by one mode. The majority of cohesive zone laws have a (partial)

coupling between normal and tangential directions, which is achieved by introducing coupling parameters in the model.

FINITE ELEMENT ANALYSIS

The finite element method is a numerical technique for obtaining approximate solution by reducing the infinite degree of freedom to finite degree of freedom for a wide variety of engineering problem.

Fig 6 : Finite Element Modeling of DCB specimen with Boundary conditions

Fig 7 : Refine mesh at the crack tip

Fig 8 : Finite element modeling of DCB specimen using shell elements

Delamination analysis for a composite double cantilever beam specimen is carried out using commercially available FE package Abaqus. Finite

element Modeling of the specimen is done in abaqus software and it is meshed using 3D hexagonal elements as shown in the fig 8. Fine mesh is done near the crack tip and at the edges and coarse mesh at the other surface. Right end of the Double cantilever beam specimen is fixed and a constant loading of 10N is applied at the other end as shown in the Fig 6.

A 3-D model is meshed using a SOLID C3D20R having 20 Nodes elements which is capable of modeling a composite structure up to 250 layers. While meshing the areas the aspect ratio is maintained in order to obtain the results accurately. Theoretically the thickness direction should contain a minimum of three nodes defining the surface and the number of nodes in the length and width (3-D) can be any arbitrary value. The meshing can be coarse at the junction and should be finer where the crack tip is present and the region around the tip. The rest of the specimen is not

the subject of interest so the mesh can be coarse enough for the solution to converge.

Typically this de-bonding technique is implemented using a contact and target elements at the interface along with Virtual Crack Closure Technique. The Finite element modeling of the DCB specimen using 3D shell elements are as shown in the Fig 8. The 4 noded shell element with reduced integration scheme (S4R) has been used for the bulk material and the 8noded 3D (COH3D8) cohesive element has been used for model zero thickness cohesive zone. These cohesive elements will have the properties of the adhesives used in the DCB specimen and the young's modulus of adhesive used , normal traction force and tangential traction force are given as input to the Abaqus software.

III. Results and discussion

From the Fig 8, It can be noted that both the cantilever beams pull apart symmetrically from the crack face, thus signifying the vertical displacement of nodes on the crack face resulting delamination. This implies that there is a strong dominance of mode I loading in this condition.

Fig 9: Crack Propagation of DCB specimen using VCCT technique

Fig 9 represents Crack propagation of a double cantilever beam specimen using Cohesive Zone Modeling method. The blue elements in between the cantilever beams represent the cohesive elements. These cohesive elements are nearly zero thickness elements which are introduced in between the cantilever beams and these cohesive elements are introduced along the complete width of the specimen and will have the properties of adhesives and during crack propagation these elements are distorted and it will give clear indication of crack propagation across any direction of the specimen.

Fig 10: Crack propagation using CZM method

The Load and displacement curves are plotted for the multidirectional Double Cantilever Beam specimen using Virtual crack closure Technique and Cohesive Zone modeling approaches.

Fig 11: Load-displacement curves for VCCT and CZM

In Fig 10 it can be observed that the curve is linear up to failure (Onset of delamination), therefore critical load (Pcrit) and displacement (δcrit) were taken as maximum. The Load-displacement response was successfully modeled by both approaches. From the graph It can be noted that the load displacement curve which is obtained using VCCT traced a linear path till it reaches the critical load, and without any softening effect which implies that in binary contact conditions using VCCT, no stiffness degradation of the contact elements at the interface takes place and crack tip changes from bonded to open. On the other hand Cohesive Zone Modeling Estimated the Critical Load little less than that the Critical Load obtained from the VCCT because of the presence of the Cohesive elements at the interface which will have the same properties that of the adhesives used to bond the cantilever beams whose stiffness is very less than the beam elements which results in stiffness degradation and thus crack opening takes place little early. A Fairly good correlation can be observed between Virtual Crack Closure Technique and the Cohesive Zone Modeling methods from the graph.

Strain energy Release rate

The strain energy release rate is a fracture parameter which is used to measure delamination characteristics of composite laminates and it can be defined as "the energy dissipated during the crack formation for a newly created crack surface area" and denoted as G. the strain energy release rate for the multi direction composite double cantilever beam is calculated using Virtual Crack Closure Technique and

933

the computed strain energy release rate distributions across the width of the specimen are shown in Fig. 11
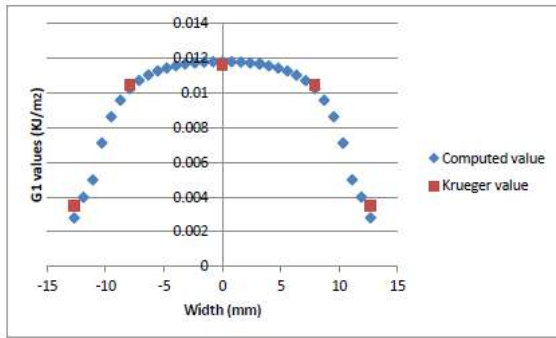
Fig 12: Strain Energy Release Rate vs. Width of the specimen

Progressive damage analysis of the DCB with unidirectional composite layups using CZM

Progressive damage analysis of the DCB specimen of unidirectional composite layups is done using Cohesive Zone Modeling method. The 4 noded plain strain elements are used for the bulk material and 4 noded cohesive elements are used for zero thickness cohesive zone. The propagated crack and the failed cohesive elements are as shown in the fig. The white colored elements in the interface show the failed cohesive elements. The Load vs. Displacement curve is plotted for the above specimen and it is compared with the experimental results. Loads are taken in 'N' and the crack opening displacement (COD) is in mm

Fig 13: Crack propagation of DCB specimen using CZM method

The Load-deflection curve is plotted for the above shown unidirectional specimen and it is compared with the experimental results and the trends shows good agreement

with the experimental results. The curve is linear upto the elastic portion (the rising curve). The load for which the 1st node in the cohesive zone fails, can be predicted by the finite element modeling. In the softening zone the trend first decreases which agree with the bilinear traction separation law which is specified as the constitutive law of the cohesive zone model. The later portion shows the diverging effect as the mesh becomes course. As the elements become finer the curve tends to come down. More the finer mesh the diverging curve will change and follow the bilinear law specified.

Fig 14: Load-deflection curve for the DCB specimen

Progressive damage analysis of the DCB with multi directional composite layups using CZM

The propagated crack and the failed cohesive elements are as shown in the Fig 14. The white colored elements in the interface show the failed cohesive elements. The Load vs. Displacement curve is plotted for the above specimen and it is compared with the experimental results. Loads are taken in Newton and the crack opening displacement (COD) is in mm.

Fig 15: Crack propagation of Multidirectional DCB specimen with shell elements

The Load-deflection curve is plotted for the above shown multi directional specimen and it is compared with the experimental results as shown in the Fig 15. It can be seen that the results obtained from the Abaqus agrees well with that of the experimental results. The use of shell elements gives better simulation than using the plain strain elements.

Fig 16: Load-deflection curve for multi directional DCB

It shows good agreement with experimental results both in elastic region and the softening portion. It can be seen that the graph follows bi-linear traction separation law with critical load occurring at 55.3 N and critical displacement at 2.30 mm which agrees well with the experimental results.

Table 3: Load-displacement values for multi directional DCB

Crack opening displacement (mm)	Load (N)	
	Experimental results	Abaqus results
1	24.33	24.35
2	47.88	47.88
2.30	53.11	55.32
3	47.61	50.64
4	39.90	43.62
5	37.29	38.12
6	34.40	35.64

Parametric study for different crack lengths
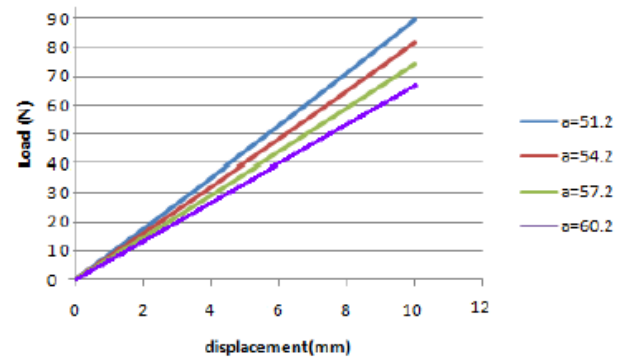
Fig 17 : load vs. displacement graph for different crack lengths

Parametric study is performed by varying the crack lengths for the Double cantilever beam specimen using Virtual Crack Closure Technique method. In the above graph Y axis denotes load and X axis denotes the crack opening displacement. From the graph it can be noted that as the crack length is increased, the load required for the crack initiation decreases. From the graph it is evident that for the same crack opening displacement the load required for the crack initiation decreases.

IV. Conclusion

Progressive damage simulation of different Double Cantilever Beam specimens is carried out using Virtual Crack Closure Technique and Cohesive Zone Modeling methods. Load and displacement curves are plotted using both the methods. The results agree well for both the methods and it is validated with the experimental results.

Strain energy release rates is evaluated for the multidirectional double Cantilever Beam specimen for the given loading using Virtual Crack Closure technique and it is validated with the results obtained from the literature review "A shell/3D modeling technique for the analysis of delaminated composite laminates", the results agrees well with the reference paper results and from the results it can be concluded that the strain energy release rate is maximum at the centre of the specimen and the energy release rates progressively dropping towards the edges.

A parametric study is also carried out by varying the crack lengths to study the behavior of crack propagation in a composite double cantilever Beam specimen to study the delamination. From the results it can be concluded that as the crack length increases the critical load i.e the load required for the crack initiation decreases and the crack propagates more early.

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Analysis on Typical T- Structural Frame Subjected to Varied Loading Angle using MATLAB

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ABSTRACT

A structure refers to a body or system of connected parts used to support a load. Important examples related to Civil Engineering include buildings, bridges, and towers; and in other branches of engineering, ship and aircraft frames, tanks, pressure vessels, mechanical systems, and electrical supporting structures are important. To design a structure, an engineer must account for its safety, aesthetics, and serviceability, while considering economic and environmental constraints.

Once the dimensional requirement for a structure have been defined, it becomes necessary to determine loads the structure must support. Structural design therefore begins with specifying loads that on the structure. This current paper work is the analysis on typical T- structural frame s ed to a load of 5kN at one end and other two ends are fixed. The load applied is at any angle etween -90° to +90°. Analysis is been carried out using MATLAB and the obtained results sh the variation of force with respect to applied load angle, which helps the designer to design the frame to support the maximum force transmitted to them.

Keywords: Structure, Structural frame, MATLAB

I. INTRODUCTION

To perform an accurate analysis a structural engineer must determine information such as structural loads, geometry, support conditions, and material properties. The results of such an analysis typically include support reactions, stresses and displacements. This information is then compared to criteria that indicate the conditions of failure. Advanced structural analysis may examine dynamic response, stability and non-linear behavior. There are three approaches to the analysis: the mechanics of materials approach (also known as strength of materials), the elasticity theory approach (which is actually a special case of the more general field of continuum mechanics), and the finite element approach. The first two make use of analytical formulations which apply mostly simple linear elastic models, leading to closed-form solutions, and can often be solved by hand. The finite element approach is actually a numerical method for solving differential equations generated by theories of mechanics such as elasticity theory and strength of materials. However, the finite-element method depends heavily on the processing power of computers and is more applicable to structures of arbitrary size and complexity.

Each method has noteworthy limitations. The method of mechanics of materials is limited to very simple structural elements under relatively simple loading conditions. The structural elements and loading conditions allowed, however, are sufficient to solve many useful engineering problems. The theory of elasticity allows the solution of structural elements of general geometry under general loading conditions, in principle. Analytical solution, however, is limited to relatively simple cases. The

solution of elasticity problems also requires the solution of a system of partial differential equations, which is considerably more mathematically demanding than the solution of mechanics of materials problems, which require at most the solution of an ordinary differential equation. The finite element method is perhaps the most restrictive and most useful at the same time. This method itself relies upon other structural theories (such as the other two discussed here) for equations to solve. It does, however, make it generally possible to solve these equations, even with highly complex geometry and loading conditions, with the restriction that there is always some numerical error. Effective and reliable use of this method requires a solid understanding of its limitations.

MATLAB is powerful computing software which is presently utilized in a number of educational institutions around the country to solve mathematics and engineering-related problems. The name of the software MATLAB stands for "Matrix Laboratory" since the built-in capabilities of this package are specifically designed for efficient handling of matrix and array operations. The effective and easy to-use computing environment of MATLAB along with availability of a large number of helpful MATLAB built-in functions has rendered it the popular tool of choice for many educators in various engineering fields. Using the MATLAB interactive environment, programs placed in script files can easily be created and edited to perform the desired computations and to generate the needed output. The capabilities of MATLAB can further be enhanced by additional "toolbox" modules that can separately be purchased through The Math Works, Inc., the company that produces the MATLAB software. These modules are designed to perform a variety of specialized tasks. The solutions presented in this paper are obtained using the basic features of MATLAB without utilizing any specialized MATLAB toolboxes.

In the submitted paper the procedure for solving structural analysis problems using MATLAB software is discussed. The goal of this paper is not to replace or alter the traditional techniques and procedures used in the subject, but as a means to complement and to make it more meaningful. The procedure is described in the paper through formulating and discussing the MATLAB solutions for simple structural frame problem applied to varying load.

II. OBLEM STATEMENT

The dimension of the frame in which ctural members support the 5kN load is as shown in Fig.1. The load is applied at any angle etween -90° to +90°.
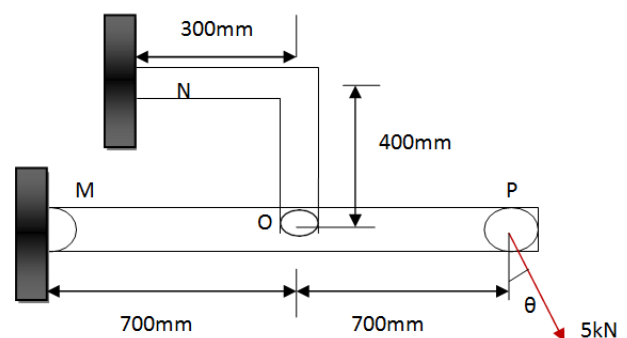
Fig. 1 T- sha structural frame

The pins at M and O need to be designed to support maximum force transmitted to them. Writing a MATL program to plot the forces at M and O as a function of d find their maximum values and corresponding angles

III. Analytical formulation

Free-body diagram of MOP of Fig. 1 is shown in Fig. 2. Note that member ON is a two-force member, thus the direction of the force O is from O to N. The equilibrium equations are,
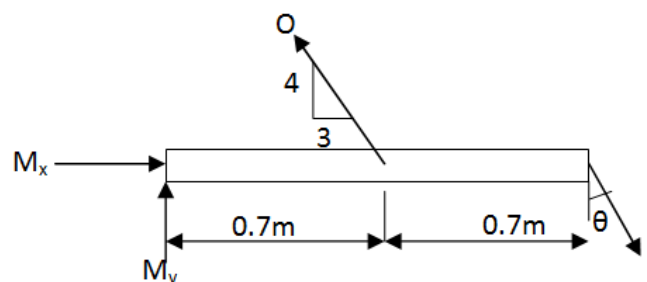
$\sum M_m = \frac{4}{5}O(0.6) - 5\cos\theta(1.4) = 0$

$\sum F_x = M_x - \frac{3}{5}O + 5\sin\theta = 0$

$\sum F_y = M_y + \frac{4}{5}O - 5\cos\theta = 0$

Solving these equations yields,

$O = 12.5\cos\theta$, $M_x = 0.6\,O - 5\cos\theta$ and $M_y = 5\cos\theta - 0.8\,O$

$M = \sqrt{(M_X^2 + M_Y^2)}$

Substitution and simplification yields

$M = \sqrt{81.25\cos2\theta + 25\sin2\theta - 75\cos\theta\sin\theta}$

Maximum value of M is obtained from MATLAB program while maximum value of O is 12.5 N at $\theta = 0$.

The maximum value of M and the corresponding angle θ will be found in the MATLAB program.

IV. MATLAB Solution

```
>> al= -pi/2:0.01:pi/2;  O=12.5*cos(al);  Mx=0.6*O-5*sin(al); My=5*cos(al)-0.8*O; M=sqrt(Mx.^2+My.^2);
[Mmax,K]=max(M);
plot(al,O,al,M)
legend('M','O')
xlabel('Teta (rad)')
ylabel('Force (kN)')
fprintf('Maximum value of M=%f and corresponding angle =%f\n',Mmax,al(K)*180/pi);
```

MATLAB Result:

The result is as shown in Fig. 3. The Maximum value of M=9.999962 and corresponding angle =-26.401685
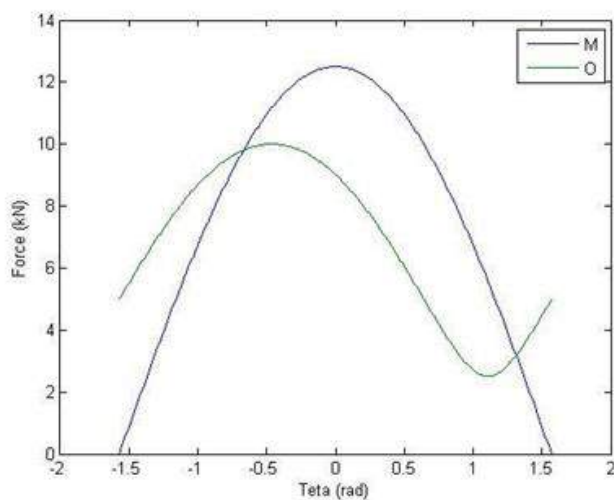
Fig. 3 Output Force(kN) vs. Teta(rad)

V. CONCLUSION

The work is analysis on typical T- structural frame subject to a load of 6kN at one end and other two ends are fixed. The load applied is at any angle etween -90° to +90°. Analysis is been carried out using MATLAB and the obtained result ows the variation of force with respect to applied load angle. The following conclusions can be drawn from the analysis are:

1. MATLAB is a powerful tool in the analysis of simple to complex problems and most effective in the analysis in structures subjected to varying loads and angles.
2. The result shows that The Maximum value of M=9.999962 and corresponding angle =-26.401685. This or These results help the designer to design the frame to support the maximum force transmitted to them.

The work is no more exhaustive, structure can be analyzed for varying loads brought and highlighted in future scope of paper work.

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Mold Fill Analysis of Injection Molding Tool

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ABSTRACT

Injection mold Pro-E part advisor which is 3D solids- based plastics flow simulation tool used to predict and eliminate potential manufacturing problems during the design stage itself. Mold flow addresses the broadest range of manufacturing issues and design geometry types associated with injection molding process.

Keywords : Confidence of Fill, Pressure Drop, Fill Time, Fill Time Injection Pressure, Flow Front Temperature, Weld Line, Air Traps

I. INTRODUCTION

One of the greatest advantages of the plastics injection molding process is that parts of extremely complex geometry can be produced "net shaped" that is, once a part is molded, cooled and ejected from a mold, it is in the form required for the next step of manufacturing process. Net-shaped parts can be produced in high volumes, in a relatively short amount of time, and at a relatively low cost. However, the many potential problems associated with manufacturing such complex shapes can result in increased time to make and have a negative impact on profitability.

To avoid the high costs and time delays associated with problems discovered in the manufacturing environment, it is necessary to consider the combined effects of part geometry, material selection, mold design, and processing conditions on the manufacturability of a part.

This paper describes features of Injection mold Pro-E part advisor which is 3D solids-based plastics flow simulation tool used to predict and eliminate potential manufacturing problems during the design stage itself. Mold flow addresses the broadest range of manufacturing issues and design geometry types associated with injection molding process.

II. OBJECTIVES

- Analyze 3D CAD solid models directly, without having to manually create an analysis mesh.
- Evaluate the manufacturing feasibility of every part design by iteration.
- Identify the most suitable plastics material.
- Optimize the part wall thickness to achieve uniform filling, minimum cycle time and lowest part cost.
- Identify and eliminate defects such as sink marks, weld lines and air traps.
- Obtain practical, results-specific advice on improving the part design.
- Visualize the orientation of the plastic to aid in maximizing part strength, especially in the vicinity of weld lines
- Determine the best gate locations for a given part design
- Estimate the impact of changes to the part design or material selection on the overall part cost.

- Communicate key design analysis aspects to the mold designer through automated, Web-based, HTML project reports.

III. MOLDING PARAMETERS USED FOR ANALYSIS

The model was analyzed using theoretical parameters Molding temperature: 40°C
Melt temperature: 270°C
Maximum Injection Pressure: 100 MP
RESULTS
The results of various predictions of Mold flow Part Advisor are discussed below.

CONFIDENCE OF FILL
The confidence of fill result displays the probability of a region within the cavity filling with plastic. The confidence of fill result is calculated from the pressure drop and temperature results. Whenever we have a part which has yellow or red sections in the confidence of fill result, we should look carefully at the pressure and temperature results to determine where the problem is. The interaction between pressure and temperature is as shown in the plot below.
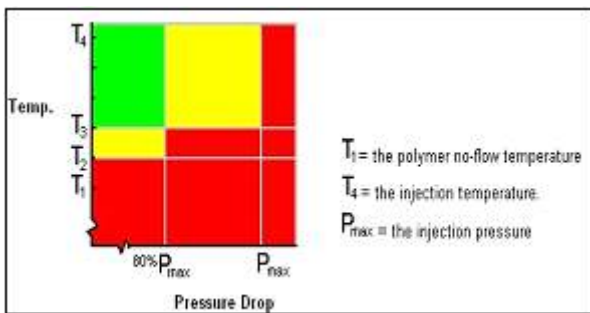
Fig 1. Temperature and Pressure plot

The temperatures on the plot are defined using the no-flow temperature for the polymer T1 and the temperature at the injection point T4 the other two temperatures are derived from the difference between T1 and T4. This difference is divided into five equal parts as shown on the plot. This means that T2 is 20% higher than T1 and T3 20% higher again, both relative to T4.

Therefore, high confidence of fill occurs when the pressure is less than 80% and the temperature is between T3 and the injection temperature T4.
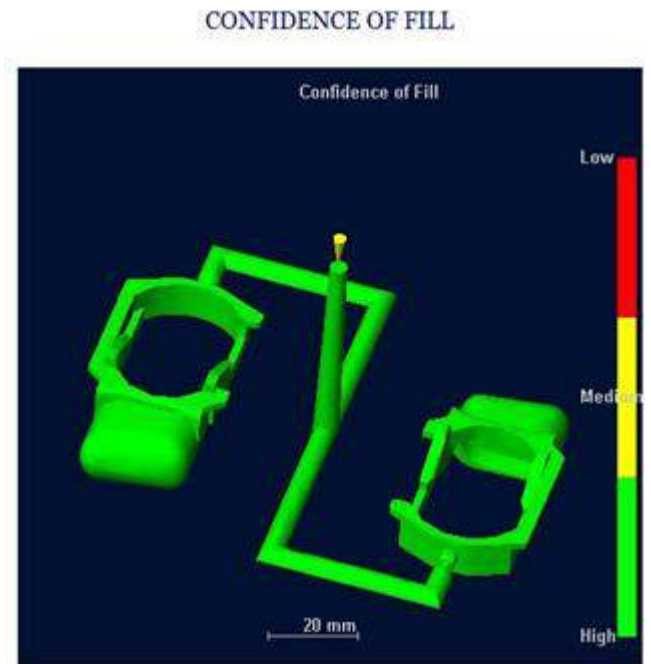
CONFIDENCE OF FILL

Fig 2. Results obtained for Confidence of fill analysis
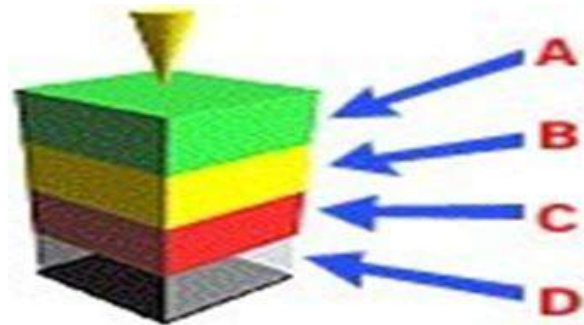
Fig 3. Colors displayed in the confidence of fill result are interpreted in the following manner:

A- Will definitely fill.
B- May be difficult to fill or may have quality problems. C- Will be difficult to fill or will have quality problems. D- Will not fill.

PRESSURE DROP
The pressure drop result uses a range of colors to indicate the region of highest pressure drop (colored red) through to the region of lowest pressure drop (colored blue). The color at each place on the model represents the drop in pressure from the injection location to that place on the model, at the moment

that place was filled. That is, the pressure required to force material to flow to that point.
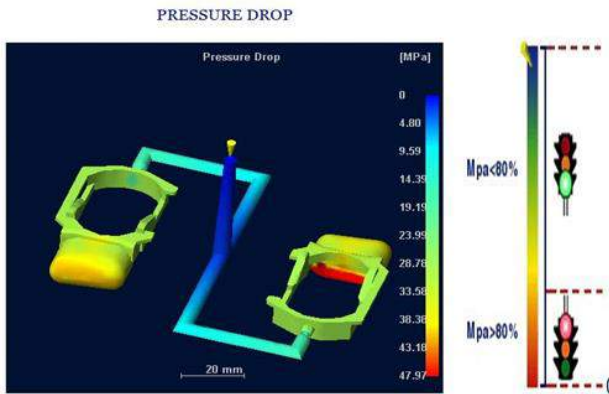
Fig 4. Results obtained for pressure analysis

The pressure drop is one factor used to determine the confidence of fill result. If the pressure drop is greater than 80% of the current value set for Maximum Injection Pressure Limit, in the Molding Parameters dialog, then this causes a yellow confidence of fill. When the pressure drop reaches 100% of the current Pressure Limit setting, the confidence of fill for this area is red. it is clear that the pressure drop is less than 80% so confidence of fill is 100%.

FILL TIME

This result shows the flow path of the plastic through the part by plotting contours which join regions filling at the same time. These contours are displayed in a range of colors from red, to indicate the first region to fill, through to blue to indicate the last region to fill. A short shot is a part of the model that did not fill, and will be displayed as translucent. By plotting these contours in time sequence, the impression is given of plastic actually flowing into the mold. For this particular component under consideration the fill time was found to be 2.99 sec.
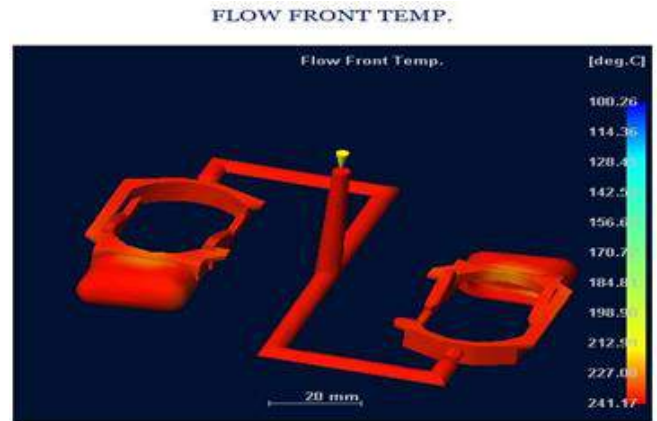
Fig 5. Time taken to fill the mold

IV. FILL TIME INJECTION PRESSURE

The injection pressure result uses a range of colors to indicate the region of lowest pressure (colored blue) through to the region of highest pressure (colored red).

The injection pressure can be used in conjunction with the pressure drop result. For example, even if a section of a part has an acceptable pressure drop, the actual injection pressure in the same area may be too high. High injection pressure can cause over packing.
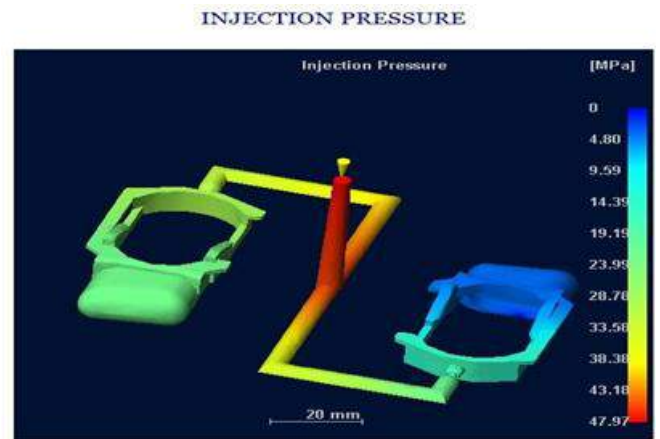
Fig 6. Plot Injection Pressure distribution with injection points

FLOW FRONT TEMPERATURE

The flow front temperature result uses a range of colors to indicate the region of lowest temperature (colored blue) through to the region of highest temperature (colored red). If the flow front temperature is too low in a thin area of the part, hesitation or short shot may occur. If it is too low in an area where weld lines are present, the weld lines may appear worse.

In areas where the flow front temperature is too high, material degradation and surface defects may occur. We have to make sure that the flow front temperature is always within the recommended temperature range for the polymer we are using. The flow front temperature is one factor used to determine the confidence of fill result. Low melt temperatures will cause yellow or red confidence of fill results.
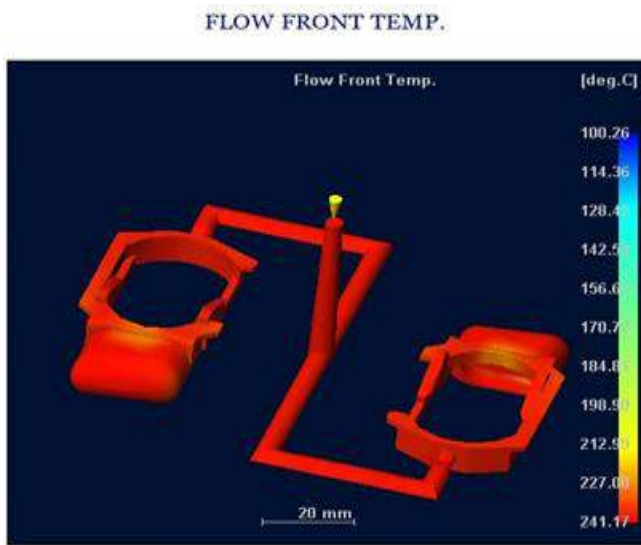
FLOW FRONT TEMP.

Fig 7. Plot of flow front temperature with double injection point

WELD LINE

Weld line forms, when the thin frozen layers at the front of each flow path meet, melt, and then freeze again with the rest of the plastic. The orientation of the plastic at the weld is therefore perpendicular to the flow path. The weld line occurs where two flow fronts meet, and the polymer molecules are misaligned. It is the sharp difference in molecular orientation at the weld which causes the significant decrease in strength at this point.

Weld lines on a plastic part can cause structural problems and be visually unacceptable. Therefore weld lines should be avoided if possible. If it is not possible to remove a weld line, it should be positioned in the least sensitive area possible. This can be done by changing the polymer injection location or altering wall thicknesses to set up a

different fill time. In a different fill time, flow fronts may meet at a different location and therefore the weld/meld line will move.

WELD LINES
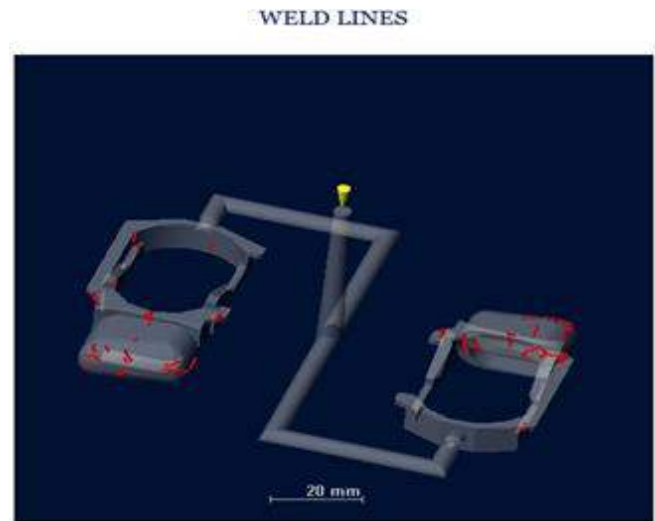
Fig 8. Weld location with two injection points

AIR TRAPS

The air trap result shows the regions where the melt stops at a convergence of at least 2 flow fronts or at the last point of fill, where a bubble of air becomes trapped. The regions highlighted in the result are positions of possible air traps.

Air traps occur when converging flow fronts surround and trap a bubble of air. This normally happens where there is an unbalanced flow path. The racetrack effect can often give rise to flow fronts racing ahead along thick paths trapping a pocket of gas. In the following example the plastic races along the thick edge trapping a pocket of gas near the corner of the part. Another problem that can cause air traps is hesitation, where the plastic slows while traveling along a thin path. In the following example the top wall is thin, slowing the flow of plastic along this path. As a result, a pocket of air is trapped in the center of the front wall.

Flow paths do not need the racetrack effect or hesitation to have unbalanced flow. In a part with uniform thickness, the physical length of flow paths may vary, and again air traps may occur. Even in the case of a part with balanced flow paths, air traps can

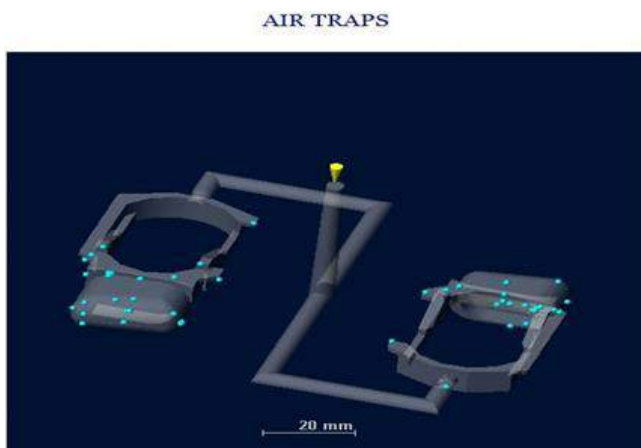still occur by inadequate venting at the end of the flow paths.

Fig11.Plot of Air entrapment

V. CONCLUSION

Above results of Part Advisor were very much useful to predict and eliminate potential molding problems before manufacturing of the tool. Also the results were helpful in better understanding of mold filling and flow. Some of the predictions and observations of mold fill analysis regarding air venting, weld lines, fill time, processing temperature and pressure, number of injection points and position, etc are driving parameters while designing the mold. For more detailed information about a model's molding behavior, Mold flow Plastic Insight analysis software can be used. Here we can address mold with gates, runner system, and cooling circuits to perform more in-depth analysis.

The overall quality of the molding is satisfactory at specified mold temperature and pressure (265 ℃ and 100 MPa) with single injection point.

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Design of Injection Moulding Tool for the Component

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ABSTRACT

This work deals with the Design and Manufacture of Injection Moulding Tool for the Component Press Button in HIPS material by the Screw type Injection Moulding process. The design and fabrication of a mould for the given component is most challenging task in plastic processing in injection molding. It determines the quality, performance and the profitability of a plastic component. The 3D model of the component is created using solid works software. The various views of different parts involved in mold are taken using this software. These views are converted to 2D drawings for easy dimensioning. Design Protocol is on conventional method, based on tried and tested norms Choice of the most appropriate option for the selection of parting line, feeding system, cooling system, venting, etc. are based on the manufacturing point of view. The above parameters help in development of various parts in mold that are functional, reliable, manufacturability and aesthetically pleasing. Manufacturing involves design of electrodes, process planning, machining and assembly. Complete process planning for each part of the tool is not carried for the sake of brevity. After fabrication of the tool, samples of the component were produced. These samples were inspected to find defects, if any.

Keywords : HIPS, 2D drawings

I. INTRODUCTION

Injection molding is a plastic-forming process used in the production of most (about 70%) of plastic parts. Injection molding is generally used in the high-speed manufacture of low-cost, high- volume products like videocassette cases, plastic cups, or children's toys, etc. The mold defines the shape of the part, as well as the path by which the molten plastic flows from the barrel of the Injection Molding Machine.

The process of injection molding begins with a barrel full of hot, liquid plastic. The plastic is rammed at high pressure into a mold. Once the plastic fills the mold, it is allowed to cool and solidify. The finished part is then extracted (usually automatically) from the mold. No chemical reaction occurs during the molding process. Any reaction that occurs would be a degradation reaction, which should be avoided.

Complex shape of different thermoplastic materials can be formed economically under high production rates. Component obtained by this process will posses high surface finish, low cost and minimum scrap as runners, gates and sprues can be reused.

Most of the tools fabricated involve standardized mold bases, for ease the construction and reduce the manufacturing cost. Only the inserts that give the internal and external shape of the component has to be fitted into the mold base. More care has to be taken while designing and manufacturing the inserts to obtain the required shape and size of the component. Overall tool design should lead to less cost, high productivity and ease of manufacturing.

Press Button is used in adjustment of seat belt in cars. It involves internal projection, which helps to hold seat belt for adjustment. It should posses good surface finish and meet the requirement so as to reduce post-processing operation. Since the material chosen for this component is High Impact Polystyrene (HIPS), Injection molding machine is used for production.

II. SCOPE OF PROJECT

Various approaches have been adopted while designing the tool for producing defect free components.

- Study of various features involved in the component for selection of parting line, gate location, vent locations, cooling circuits, etc.
- Choice of various tooling materials and molding machine to produce large volumes of plastic component.
- Basic calculations for determining cavity wall strength, shot weight, clamping force, cooling and cycle time, etc. are carried.
- 3D modeling of the tool has been done for physical representation before manufacturing.
- Trail and trouble shootings to obtain sound components.

III. OBJECTIVES

The main objective is to develop a protocol of the tool for the given component using scientific approaches. The study is made to design the mold as simple as possible from the cost and manufacturing point of view, simultaneously maintaining the quality of the component within the specified limits.

IV. METHODOLOGY

The basic concept involved in this method is to attain the objective of the systematic and correct tool design; a well-planned approach has been employed. The methodology consists of the following.

- Component analysis.
- Solid modeling of the component.
- Step by step approach to mould design.
- Selection of tooling materials.
- Solid modeling of the tool.
- Tool fabrication, assembly and tryout
- Injection molding defects

TOOL DESIGN
In this section step by step approach to the design of Injection Molding Tool is set based on experience, empiricism and expertise as applied to "Press Button" and various design calculation are given here

COMPONENT DETAILS
Material : HIPS – (High Impact Polystyrene)
Density : 1.05 gm/cm3
Volume : 4.86 cm3 Mass : 5.00 gms

COMPONENT DESCRIPTION

Press button component is used in cars for seat adjustments. The Plastic material used for the press button component is HIPS as per the customer requirement. It involves internal projection, which helps to hold seat firmly while driving the vehicles. It should posses good surface finish and meet the requirement so as to reduce post- processing operation. The Component drawing is received from the customer end. The component has a varying wall thickness with a minimum wall thickness of 1.75mm & maximum wall thickness of 6.36mm. The outer dimensions of the component are 32x55mm & have a total depth of 12.75mm.

The inner surface is the functional surface; therefore there should not be any ejection marks. Isometric view of exterior of the component is shown in Fig.

FRONT VIEW   **SIDE VIEW**
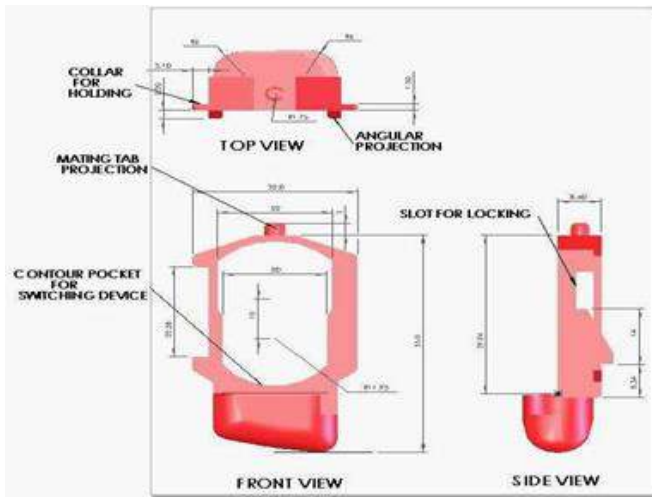
SELECTION OF PARTING PLANE

The selection of parting plane entirely depends on the shape and geometry of the component. After careful study of the component drawing, a stepped parting plane is chosen. This permits easier ejection of the casting. The criteria for selection of parting plane are detailed are shown in fig

PARTING SURFACE
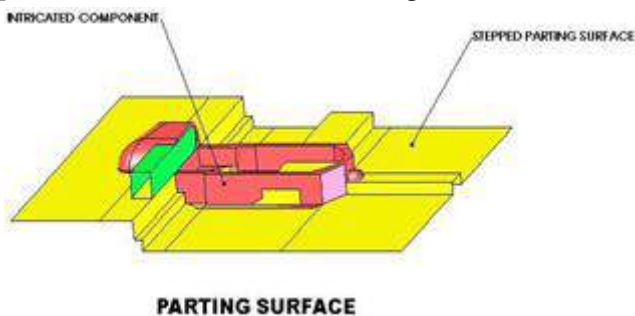
Weight of the component = 5.0gms
Where, W = Weight of the component (gms).

$\square$ = Density of the plastic material used (gm/cm3) V = Volume of the component (cm3).

b) Moulding weight = Weight of the component X Multiplication Factor = 5.0 X 1.05 = 5.25gms

The weight of sprue & runner related to the moulding generally must not be neglected. This should be considered in the formula when determining the moulding weight. The moulding weight should be substituted in the formula & multiplied with the multiplication factor.

DETERMINATION OF CLAMPING FORCE

Cf = (AP + AR) n X (1/2 to 1/3 of IP) Where, Cf = Clamping force in tonnes.

AP = Projected area of moulding = 57.73X25.50 = 1472.0mm2

= 14.72 cm2

AR = runner area = 15% of projected area of the component

= 0.15 X 14.72 = 2.208 cm2

n = number of cavities = 2

IP = Injection Pressure in N/cm2 Injection Pressure of HIPS = 71 - 215 N/cm2 IP = $\square$1/2 (215) ·1/3 (215)$\square$/2 = 89.18 N/cm2

Substituting these values in the above equation

Cf = (14.72 +2.208) 2 X (89.18) Cf = 3019.53 N/cm2

Cf = 3019.53X9.81 = 29621.60 kgs

Cf = 29.62 Tones $\square$ 30 tonnes

DETERMINATION OF NUMBER OF CAVITIES

While deciding the number of cavities, approximate dimensions of the component is taken into account; here approximate dimensions of "Press Component" are 32x55mm. And also shot weight, clamping force, injection pressure and number of components to be produced from the tool, here 100K number to be produced. Horizontal Injection Moulding Machine SP-30T was to be employed for production in the plant.

WEIGHT OF THE COMPONENT
a) Actual weight of the component W = $\square$ X V
W = 1.05 X 4.86

SHOT CAPACITY

Shot capacity of the SP30 machine (screw type) = 44 gms from the machine specification manual.

Actual shot capacity required

Actual shot capacity = {W + (WAR & WAG)} n Where,

W = weight of the component (gms) = 5.25gms

WAR & WAG = Weight of runner & gate area respectively

= 15% of component weight = 0.15 X 5.25

= 0.78 gms ≈ 0.80 gms n = number of cavities = 2

Substituting these values in the equation

Actual shot capacity = {5.25 + (0.8)} X 2 = 12.10 gms

As the actual shot capacity is less compared to shot capacity of the machine. Hence SP30T, which is available, can be used.

PLASTICISING CAPACITY

PR of HIPS = PR of Polystyrene X ⟦ QA/QB ⟧

Where, PR = Plasticising rate (gm/sec) PR of Polystyrene = 4.7 gm/sec

QA = total heat content or thermal capacity of Polystyrene

= 57 cal/gm.

QB = total heat content or thermal capacity of HIPS

= 58 cal/gm. Substituting these values in the equation

PR of HIPS = 4.7 X 57/58

= 4.61 gm/sec

= 16.59 kg/hr

≈ 17.00 kg/hr

The clamping force, shot capacity & Plasticising rate required for the component is well with in the range of SP30T. Therefore SP30T is selected to process the moulding operation.

DESIGN OF CAVITY & CORE INSERT

The minimum wall thickness of Cavity insert is calculated based on the empirical formula given below:

$$t_i = 3 \frac{12.P.L^4.a}{384.E.b.\delta}$$

Where, t_i = Minimum wall thickness of the insert (mm) P = Maximum Cavity Pressure (N/cm²),

Usually cavity pressure should not operate at above 85% of injection pressure.

Injection pressure for HIPS material = 71 – 215 kg/cm² Therefore, Maximum Cavity Pressure P = 85% X 215

= 181.94 N/cm²

L = Maximum length of component = 57.73mm = 5.773 cm

5.80 cm

a = Maximum cavity depth of component = 8.40 mm

= 0.84 cm E = Modulus of elasticity of steel = 2.1 X 106 kg/cm²

= 2140.67X10³ N/cm²

b = Cavity plate thickness = 36mm = 3.6cm

δ = Maximum deflection of side wall = 0.0025 − 0.005 cm Substituting the above values in the equation

$$t_i = 3 \frac{12 \times 181.94 \times (5.80)^4 \times 0.84}{384 \times 2140.67 \times 10^3 \times 3.6 \times 2.5 \times 10^{-3}}$$

t_i = 0.654 cm ˜ 6.54mm

Select the minimum wall thickness of the inserts = 20mm Therefore, by considering the wall thickness & component size, the size of the cavity insert: 66mm X 46mm X 30mm.

Core insert

The length & width of the core insert is taken 66mm X 46mm in order to accommodate the finger cam pins (side core) placed at an angle 15⁰ to form the side core for easy ejection, cooling circuit & fasteners. The core inserts thickness taken as 36mm.

DESIGN OF FEED SYSTEM
RUNNER DESIGN

Runner Type: In this design, half round runner is employed to feed the component, because of its ease of manufacturability i.e., Inexpensive, less scrap compared to all other cross-sections.

The runner diameter is calculated by the following formulae:

$$d_r = \sqrt{W} \times 4\sqrt{L_r}$$

Where, d_r = diameter of the runner (mm)

W = weight of the component with losses = 5.25 gms

L_r = length of the runner = 90.0 mm

Substituting these value in the above formulae (4.7)

dr = ⬜5.25 X 4⬜90 3.7

= 2.0 mm

The half round diameter of the runner D = ⬜2 X dr D

= ⬜2 X 2. = 2.32 mm

Since by considering the Material wastage, Pressure drop & Cooling time. The half round diameter 'D' of the runner is taken as 5mm.

GATE DESIGN

In this design, the Rectangular Edge gate is employed to feed the component.

Since this type of gate is used for two impression rectangular shaped moulding, on two plate moulds and offers easy de-gating & material savings.

i. Gate width: The gate width is calculated by the following formulae

WG = nm X⬜ Ac

30

Where, WG = width of the gate (mm). nm = material constant = 0.6 for HIPS

Ac = Total surface area of the component = 3853.57 m WG = 0.6 X⬜3853.57

30

= 1.24 mm ~ 1.00 mm

ii. Gate depth: the gate depth is calculated by the following relation:

h = 0.7nmt Where, h = gate depth (mm) nm = material constant = 0.6 for HIPS

t = average wall thickness of the component = 1.75mm h = 0.7 X 0.6 X 1.75= 0.735 mm ~ 1.00 mm

The depth of the gate controls the time for which the gate remains open. This gate open time must be sufficient for the material to reach the extremities of the impression. Therefore gate depth is taken as 1mm considering de-gating problem, pressure loss.

Therefore gate depth 'h' = 1mm

The land length of the gate should be 1 to 2mm, & taken as 2.00 mm DESIGN OF FINGER CAM PIN

Finger cam pin

Split movement required to clear the component 'Ms'= 5.0mm Finger cam diameter 'Ø' varies from 15 – 25mm. (Taking the average i.e., 20mm as finger cam pin diameter).

Clearance 'C' = 0.5mm/side.

Effective length 'Le' of finger cam can be determined by using the empirical formulae:

Le = Ms + 2C Sin Ø Sin2 Ø

Le = 20 + 2(0.5)

Sin (20⬜) Sin2 (20⬜) Le = 16.17 mm ~ 16 mm

Effective length of the finger cam pin = 16.00mm

Where, Le = effective length of the finger cam pin.

DESIGN OF GUIDE PILLAR AND GUIDE BUSH

The size of the guide pillar is of great importance in the mould. The working diameter of the pillar & the number of guide pillars will depend on the size of the mould & whether or not a side force is likely to be exerted on it. So the guide pillars should withstand side forces to be exerted on it. The moulds with deep & heavy cross- sectional cores exert side thrust & the guide pillars should be strong enough to absorb them without damage.

Guide Pillar

Side thrust Q = ac x hc x Pc

Where, ac = Maximum side of core = 20 mm = 2.0cm

hc = Height of core = 8.5 mm 0.85 cm

Pc = Cavity pressure = 30.58N/cm²

Q = 51.986N

Working diameter (Dp) of guide pillar > ⬜4Q / ⬜NPfs

Where, Q = side thrust (Kgs)

NP = Number of pillars = 4

fs = Shear stress = 163.09N/cm² Dp = > 3.18 mm

The size of the mould of the present project is215 X 230 mm, therefore working diameter of the pillar is chosen as 15mm for safe design and to have sufficient strength to withstand side thrust.

Stem diameter of guide pillar = working diameter + wall thickness (say 4 mm)

= 15 + 4 X 2 = 23 mm ˜ 25 mm

Collar diameter= Stem diameter of guide pillar + minimum thickness (say 2 mm) = 25 + 2 X 2 = 29 mm ˜ 32 mm

Total length of guide pillar = cavity housing thickness + 15mm (guiding length in top plate) + Core housing thickness

= 26 + 15 + 46 + 15 = 102 mm ˜ 116 mm

Table for the range of sizes of pillar

Size of the mould (mm x mm)	Working diameter of the pillar (mm)
100 X 100	10
100 X 150	13
150 X 200	16
200 X 250	19
250 X 300	22
300 X 400	24
400 X 600	32
600 X 700	36

Guide Bush

ID of guide bush = Working diameter of guide pillar = 15 mm

OD of guide bush = ID of guide bush + wall thickness = 15 + 2(4) = 23 mm˜ 20 mm

Collar diameter= OD of guide bush + minimum thickness (say 2 mm)

= 25 + 2 X 2 = 29 mm˜ 25 mm

Length of guide bush = Cavity housing thickness + Top Plate

= 26 + 27 = 53 mm ˜ 50 mm Tolerance grade:

Mould plate bore & fitting diameter of the pillar: H7/k6 Guide bush bore & working diameter of the pillar: H7/g6 DESIGN OF EJECTION SYSTEM

For this component, Pin ejection is chosen for ejecting the component out.

Determination of Ejection Force

Ejection force required to eject the component is determined by using the formula

PE = S x t x Ep x A x □ / {d (d/2t - d□/4t)}

Where, PE = Ejection force required in Kgf

t = Average thickness of component = 0.175 cm

Ep = Elastic modulus of plastic material = 22 X 103 Kg/cm2

A = Total area of contact between moulding and mould faces in line of draw = 38.54 cm2

= Poisson's ratio of the plastic = 0.4 to 0.5

= Coefficient of friction between plastic and steel = 0.5

d = Circumference of moulding surrounding male core = 136.21 cm S= Thermal contraction of plastic across diameter'd'

= Co-efficient of thermal expansion X temperature difference between softening Point & ejection temperature ºC X d (cm)

= 6.5 X 10-5 X (195 – 20) X 136.21 = 1.549 ˜ 2.0

Ejection force required PE = 3.73 kgf ˜ 0.0038 tonnes

The ejection force required to eject the component is within in the capacity of SP-30T machine. Therefore design is safe.

DESIGN OF COOLING SYSTEM

In this design work, cooling of cavity insert & core insert are provided. Since the core and cavity inserts are designed in rectangular shape, rectangular cooling circuit is adopted with inlet & outlet. It is the most efficient cooling for this design because as the cooling channel covers the maximum surface area of the component. All drillings within the insert should be interconnected and plugged. The rectangular circuit ensures that the flow-ways are close to all four walls of the cavity, allowing a more even temperature control & highest heat transfer co-efficient will occur when the cooling channels are directly in the cavity or core insert.

a) 1) Heat to be transferred from mold per hour (Qw)

Qw = Shot weight X QB X number of shots/hr

Where, Shot weight = 5.25gms

QB= total heat content or thermal capacity of HIPS = 58 cal/gm Number of shots/hour = 180(Assume 15 to 20 sec per shot practically possible)

□ Qw = 5.25 X 58 X 180 = 54810 cal/hr

2) Heat to be transferred per hour by the cooling system (Qc) In practice, it is assumed that only one-half of the total heat of the moulding is dissipated into mould, which should be taken away by the

Cooling system. The other half of the heat is removed by Conventional modes of heat transfer such as Convection & radiation. Heat to be removed by cooling system = 0.5 Qw

= 0.5 X 54810, Qc = 27405 cal/hr

3) Amount of water to be circulated per hour to dissipate heat (mw)

mw= Qc / {K (Tout - Tin)} Where,

Qc = heat to be removed by cooling system (water) = 27405 cal/hr K = Constant to allow for heat transfer efficiency = 0.64 for direct cooling

Tout = Outgoing water temperature C Tin = Incoming water temperature C Tout - Tin = 3C to 5 C of injection mold will have a significance deviation from the above said values. However, these values can be used as a basis to which the other deviations in the practical designs can be added.

4) Solidifying time (Ts):

The solidifying time is proportional to the square of the wall thickness.

Ts = (QB) t2 / {p (Tmaterial - Tmold) 8} Where,

Ts = Solidifying time (sec)

 = Density of the plastic material used =1.05gm/cc

QB = total heat content or thermal capacity of the plastic material = 125 cal/gm.

t = average wall thickness of the component = 0.175 cm

p = Thermal conductivity of plastic material = 7 X 10-4 cal/cm.sec.C

Tmaterial= Injection temperature of material = 270C Tmold = Temperature of mould = 80C

Substituting these values in the above equation (4.18)

Ts= (1.05 125) 0.1752 / {7 10-4 (270 – 80) 8}

Ts = 3.77 sec ~ 4 sec

V. CONCLUSION

Design procedures developed in this work for the production of tool for the component Press Button to be produced through injection molding processes

using HIPS material has been successfully validated by conducting tryout operation.

A number of new techniques have been studied. The expertise, experience and empiricisms are followed to greater extent that scientific analysis, logic and hierarchy of decision making developed for this specific task. A tool built which works on initial trial appear to be satisfactory.

The project undertaken has been successfully accomplished by carrying out a design exercise, choosing a steel alloy for the mould with good balance of strength & manufacturability. Engineering the gating to promote soundness. Satisfying technical, economic and delivery schedule requirements. The design of the Injection mould has been approved. The tool is manufactured.

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Influence of Process Variables and Finite Element Analysis on Friction Stir Welded Dissimilar Alloys

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ABSTRACT

Welding Technology is a vital manufacturing process used to join metal alloys. Friction stir welding (FSW) is a solid-state welding technique in which metal is heated to plasticized state due to the friction and stirring action of the non-consumable tool over the surface of the base metals, resulting in sound weld. In the present work, influence of various process parameters on dissimilar welding of AA 6061 T6 and AA7075 T651aluminium alloys is investigated in order to improve the mechanical strength properties. Conical and cylindrical tool pin profiles are chosen to perform butt welding. The process parameters considered for the study to determine the ultimate tensile strength (UTS) and elongation of the six welded joints are tool geometry, rotational spindle speed of about 600,800 and 1000 RPM and feed rate of about 30,45,60 mm/min respectively. Finite Element Analysis, parametric model with base weld plates and the tool is performed using ABAQUS. It is observed that irrespective of the process parameters cylindrical tool rendered the better tensile and elongation property in contrast to the conical tool.

Keywords : AA6061 T6, AA7075 T651, FSW, UTS, Elongation, ABAQUS.

I. INTRODUCTION

In aerospace industries, heat treatable aluminium alloys finds wider application because of its higher ductility and good strength. Friction stir welding is a new welding process influencing the industry where heat due to the friction is combined with forging pressure to produce defect free high-strength joints. [1]. FSW is comparatively a new welding process potentially proven in joining materials which are conventionally difficult to weld. Friction stir welding process renders the scope of welding elements at high productivity with flat geometry. Light metal alloys, aluminium based metal matrix composites (MMCs) and dissimilar metals can be welded by using FSW process [2]. Friction stir welding is concerned with joining of thermally softened material heated by friction due to sliding contact with a heat resistant material in the form of a pin rotating at a high speed. The softened material is pushed to the advancing zone by the shoulder of the tool in contact with the work piece. Normally the tool is fed to the full depth over the butt joint of the work piece parts.

Finite Element Methods (FEM) are numerical techniques in which approximate solutions to boundary value problems for differential equations are obtained. This method involves variation methods to reduce error functions and to produce stable solutions. A lot of tiny straight lines and small elements with finite length can be connected by FE methods including procedural steps in case of solving complex equation within the domain under observation [3]. After welding process, FSW simulations performed on Altair's Hyper Weld can

predict the temperature distribution at different zones for different parameters. Process modelling input have to be discussed in terms of geometric parameters, process parameters and material parameters considered during the friction stir welding process [4].

During FSW process, the heat transfer into two boundary value problems (BVP)-a steady state BVP for the tool and a transient BVP for the workpiece is formulated. Finite element analyses were carried out to determine the heat flux generated from the friction to the workpiece and the tool. Transient finite element analyses models the friction stir welding process. Heat transfer analysis exhibits the heat generated from the friction between the tool shoulder and the workpiece. The tool holding time and rotational speed are increased when there is a maximum temperature near the weld. As tool transverse speed increases, temperature decreases [5].

The element having three-dimension thermal conduction capability can be used for a three-dimensional, steady-state or transient thermal analysis. The element is defined by several nodes with temperature as single degree of freedom at each node and by the orthotropic material properties. The element can be replaced by an equivalent structural element for the structural analysis [6].

From the literature, it is observed that influence of different process variables on friction stir welded dissimilar alloys and Transient Finite Element analyses are investigated. Study of process parameters and Finite Element analysis involving cylindrical/conical tool are very limited especially at T6/T651 conditions. Hence, in the present study, the welding process variables effect on the mechanical properties like tensile strength and elongation have been investigated. Static Structural analysis is carried out to predict deformation, stress and strain at various zones.
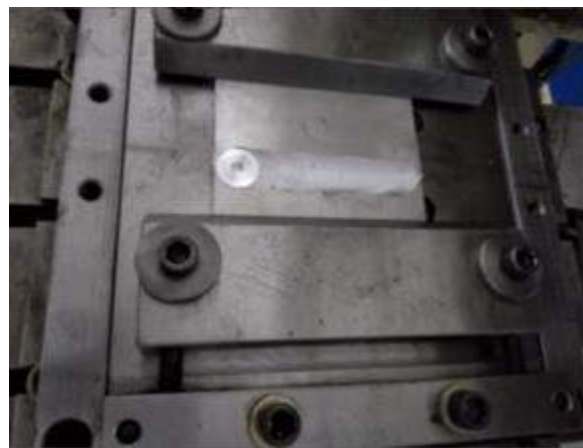
II. EXPERIMENTAL PROCEDURE

6.35 mm thick sheets of 6061-T6 and 7075- T651 Aluminium (Al) alloys were cut into samples with a width of 70 mm and a length of 130 mm. The dissimilar welding was performed on a 3 Ton FSW machine as shown in figure 1

(a) and (b). Table 1 and 2 shows the constituents and properties of selected alloys.

(a)

(b)

The FSW process is illustrated schematically in figure 2.

TABLE 1. Chemical compositions of alloys.

Elements	Mg	Si	Fe	Cu	Cr	Zn	Mn	Ni	Ti	Pb	Sb	Al
AA6061T6	1.03	0.6	0.570	0.253	0.242	0.137	1.103	0.002	0.002	0.002	0.005	Bal.
AA7075 T651	2.536	0.12	0.306	1.091	0.186	6.185	0.041	0.029	0.050	0.022	0.044	Bal.

TABLE 2. Mechanical properties of alloys

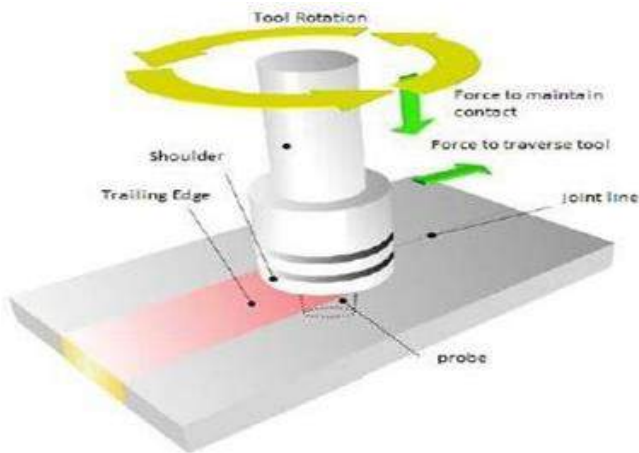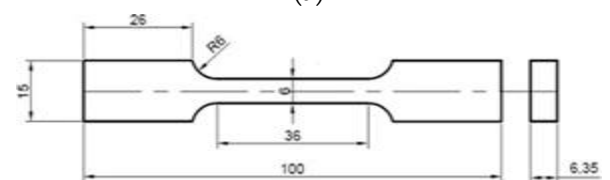| Alloys	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
AA 6061 T6	298.28	15.47	111.65
AA 7075 T651	556.09	17.86	171.65

Fig 2. Schematic view of Friction Stir Welding (FSW) process [4]

The tool rotating at desired speed is plunged with shoulder contacting the surface at the beginning of the joint with appropriate depth. The tool continues to rotate as it traverses the entire length and then retracts. The frictional heat emanating during the process initiates the plasticization and subsequent consolidation of the material furthering the formation of fine- grained structure. Thereby resulting in a complete weld from one end of the material to the other end [7]. The conical and cylindrical pin profiles were selected to carryout the experiments. The schematic and photographic views of the tool pin is shown in figure 3 (a-c).

(a) (b) (c)

Fig 3. (a) Conical Tool, (b) Cylindrical Tool, (c) Photographic view of the tools used

The operating variables used in the study is shown in Table 3.

TABLE 3. Operating input parameters

TABLE 2. Mechanical properties of alloys

TABLE 1. Chemical compositions of alloys.

Based on strength parameters and elongation, friction stir welded samples were evaluated. The samples were machined using Wire- Electric discharge machining as per ASTM B557M standard [8]. The tensile parameters was measured using INSTRON (MAKE-FIE) UTM machine. The welded specimens, tensile standard specimen, the machined tensile samples before and after testing are shown in figure 4 (a- d).

(a)

All dimensions are in mm

(b)

(c)

(d)

Fig 4. (a) Welded specimens, (b) Schematic view of tensile specimen, (c) Tensile samples before testing, (d) Tensile samples after testing

The experimental ultimate tensile strength (UTS) and % elongation of the welded samples are shown in Table 4.

TABLE 4. Experimental results

	Runs					
	1	2	3	4	5	6
UTS (MPa)	78.79	122.54	165.12	125.88	179.11	161.85
Elongation (%)	5	5	16.93	10.16	13.48	11.73

Tensile properties tends to improve with surge in feed rate and spindle speed up to a certain limit and drops as seen in figure 5. The friction stir welding adheres the process of combined plasticizing and stirring the material under the influence of the different tool geometries. The age hardened and solutionized nature of the parent metal, relaxation experienced over the surface owing to thermal heating /stressing may lead to reduced order of strength properties. With increasing speed, higher temperature induced in the zone results in softening and possibly declining nature of tensile strength. When compared to conical tool, cylindrical tool provide better contact of the tool with the surface providing better stirring effect, enhanced deformation and strain strengthening resulting in

grain recrystallization which favors the strength property.

Tensile property increases with increase in feed rate. With increase in feed rate, the stirring waves traverses at a faster pace leading to sub- grain formation with the creation of dislocation site contributing to improved tensile

Elongation

The metallurgical studies for the welded samples were performed as per ASTM standard [9] with the help of MOTICAM 1000 microscope. The specimens from the welded samples were well- polished and etched with Keller's solution to unveil the salient traits of the microstructure.

III. RESULTS AND DISCUSSIONS

The influence of spindle speed and feed rate on UTS and % elongation for two tool geometries is shown in figure 5.
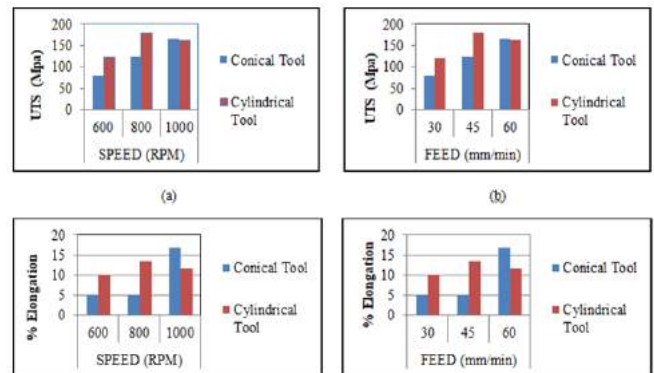

Fig 5. Infuence of (a) Speed on UTS, (b) Feed on UTS, (c) Speed on % elongation, (d) Feed on % elongation comes into play contributing to reduction in property [10].

More heat is generated in the weld surface at higher rotational speed and traverse feed, thereby effective recrystallization of grains takes place with overaging effect leading to higher ductlity. Beyond a certain limit, the elongation property drops down with increase in feed rate . At higher traverse feed, the time required for stirring is less which further

reduces the efficiacious mixing of the stirred material and hence reduction in elongation [11].

IV. INTRODUCTION TO FEA

The Finite Element Analysis (FEA) is a numerical method for solving problems of engineering and mathematical physics. This method is useful for problems with complicated geometries, loadings and material properties where analytical solutions cannot be obtained.

Discretizations involves dividing a model into an equivalent system of many smaller bodies or units (finite elements) interconnected at points common to two or more elements (nodes or nodal points) and/or boundary lines and/or surfaces.

Computer model of a material under FEA is stressed and analyzed for particular results. In new product design and existing product refinement, the concept of FEA is involved. Proposed design verified by an industry can reach customer specifications prior to manufacturing or construction. In structural failure, FEA determines the design modifications to arrive at new condition.

In industry, there are generally two types of analysis: 2-D and 3-D modeling.

2-D modeling is having more simplicity where normal computer performs analysis and tends to yield less accurate results whereas 3-D modeling obtains more accurate results with the ability to run on all the fastest computers effectively. The programmer can adopt numerous algorithms (functions) within each of these modeling schemes in which system behaves linearly or non-linearly. Linear systems are less complex and generally do not consider plastic deformation into an account. Non-linear systems consider plastic deformation into an account and capable of testing a material till failure occurs [12].
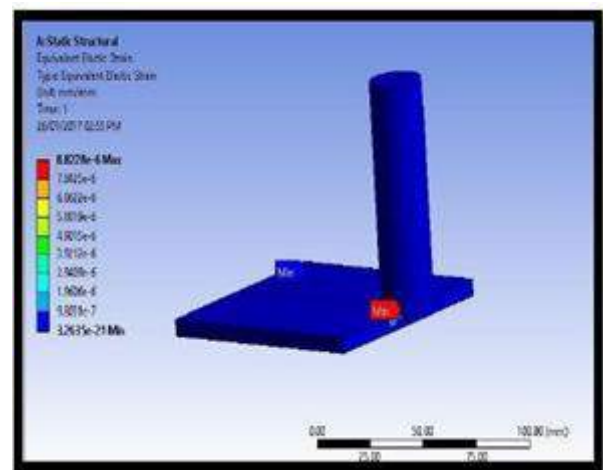
Structural analysis of FSW speed at 410 RPM is shown in figure 6 (a-c).
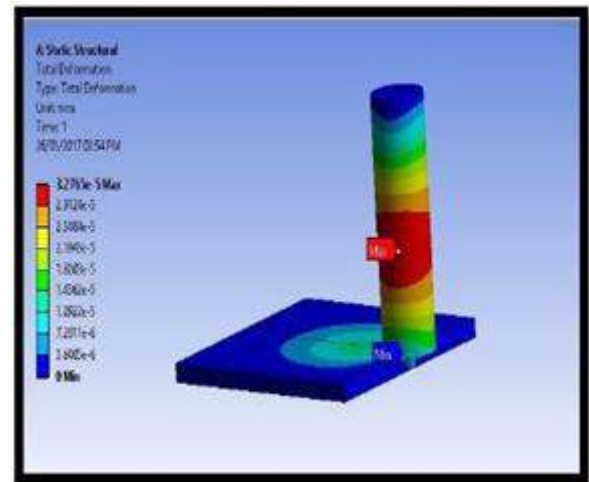
(a)
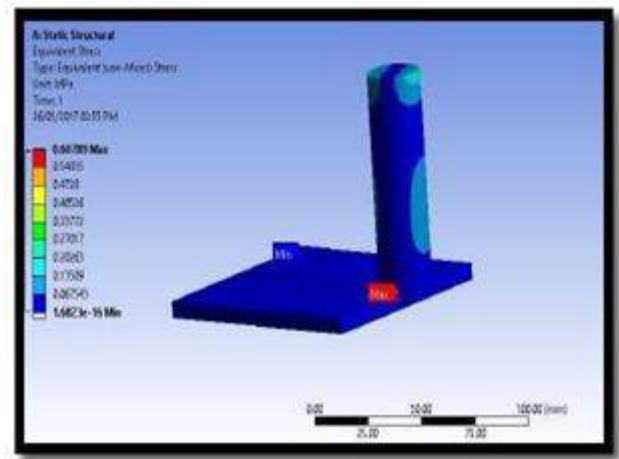
(b)

(c)

Fig 6. (a) Deformation, (b) Stress, (c) Strain [12]

TABLE 5. Static result table [12].

SPEED(RPM)	DEFORMATION(mm)	STRESS(N/mm²)	Strain
750	0.00010961	2.0336	2.9151e-5
560	0.00006119	1.1339	1.6458e-5
410	3.276e-5	0.60789	8.8228e-5

From the above structural analysis carried on the circular tool rectifying deformation, stress and strain, it is noticed that as speed of the tool increases there is a relevant increase with respect to the stress valves.

V. CONCLUSIONS

The following conclusions were arrived based on the investigation:

- Bounded by the stipulated attribute limits of feed rate of 45 mm/min and spindle speed of 800 rev/min are recommended to achieve good weld.
- Irrespective of the process parameters cylindrical tool renders better tensile and elongation property in contrast to conical tool.
- The increasing trend in feed/speed culminates in drift in tensile strength, then peaks up and finally attenuates.
- Maximum value of UTS and percentage elongation observed are 179.11 MPa and 13.48% respectively.
- Structural analysis is performed on the circular tool to verify the deformation and stresses.
- From the results, stress values increases by increasing the speeds of the tool.

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Characterization of Aluminum-E-Glass Fibre - Epoxy Reinforced Fibre Metal Laminates Composites

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ABSTRACT

Fiber Metal Laminates (FMLs) are hybrid materials consisting of layers of thin metal sheets and fibres in sandwich pattern. These are best known and extensively used in the Aerospace applications. Aiming this objective, new lightweight FML has been developed by hand layup technique using thin aluminium and E-glass fibres. Tensile tests had been carried out in accordance to ASTM standards to witness the quality of the specimens. From the experimental work, load v/s. displacement and assessing the strength it is observed that the mechanical properties of woven roving mat with aluminum type FML composite proved to be possessing 11.5% higher than the rest of the specimens characterized.

Keywords: Chopped Strand Mat (CSM), Fiber Metal Laminates (FML), Glass Fiber reinforced aluminum

I. INTRODUCTION

Post World war-II scenario witnessed plenty of changes in the area of material research. Owing to the process of depletion of traditional metals, such as steel, cast iron, aluminium, zinc, copper, magnesium, titanium and their alloys, new technologies are being evolved by material and design engineers, by inventing a new category of materials named metal fibre composites, which are formed by combining different materials for the high end applications. A Fibre Metal Laminates (FML) are a family of relatively new hybrid materials comprising thin aluminum sheets with pre-impregnated synthetic fibres. The technique was originally developed at the Delft University of Technology. It consisted of thin sheets of aluminum, bonded with fibre adhesive layers. This laminated structure behaves much the same as a simple metal structure, but with considerable specific advantages with regard to properties, such as metal fatigue, impact, corrosion resistance, fire resistance, weight savings and specialized strength properties and have significant properties that are useful in the aviation field [5-6]. Glass fiber reinforced epoxy and aluminum alloy is considered as hybrids composite Fiber–metal laminates. These types of material have applications in aircraft structures such as the upper fuselage of aircrafts [1-3]. Fibre Metal Laminates are well-known by their superior damage tolerance and their relatively limited crack propagation rates [3, 4]. Machinability and durability related to many metal of superior fatigue properties are the advantages of such systems [4-6]. These specific materials are currently found an extensive use in the wide range of load bearing engineering applications. Fiber metal laminates are a family of highly fatigue and impact resistant laminated composite materials. They offer the structural designer a damage tolerant, light-weight and cost-effective replacement for conventional aluminum alloy sheets or composites in advanced transport structural applications [7]. Many authors have reported GLARE composites and their applications but ultra thin aluminum foil composites

are scarce in the literature. Therefore the present work explores the compatibility and characterization of ultra thin aluminum metal & E-glass fibre composites subjected characterization tests and results are discussed.

II. Specimen Preparation and Experimentation
• Materials and Test Methods

The fibre metal laminates consists of thin aluminum foils bonded together with appropriate E-glass (CSM, WR)/ in epoxy matrix layers. The volume fraction of fibre to matrix maintained to be 60:40. Glass fibre (220 GSM) supplied by Vitrotex Saint Gobain Bangalore and blended with CY219 Huntsman epoxy system. The tensile properties of prepared composites are tested according to ASTM D3039 standard and shown in Table 1.

Table1. Specimen Details

Sl. No.	Lay-up	Thickness (mm)	Weight (gm)
1	AlF: Epoxy		11 gm
2	AlF:CSM:Epoxy	3	18
3	AlF:WR:Epoxy		21
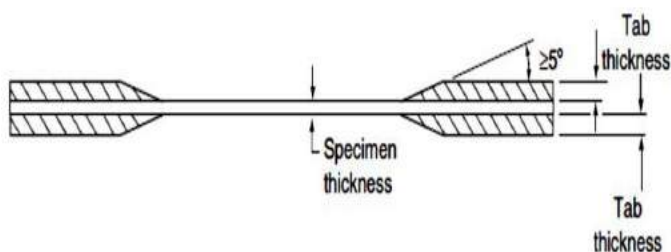
Fig.1 Fibre Metal Laminate Specimen

III. Results and discussion

The tensile properties, such as tensile strength, modulus, and elongation of the FML composites were determined by static tension tests in accordance with ASTM D3039 and the values tabulated in Table.2.

Table. 2: Tensile Test Values

Specimen ID	Yield Strength (MPa)	Ultimate Strength (MPa)	Elongation (%)	Modulus (MPa)
1	196	214	2.9	33.8
2	267	496	3.8	50.8
3	298	579	4.1	57.4

The Fig.2 to Fig.5 exhibits the load versus deflection behavior of the various specimens. It is observed that a plateau region with downward tendency suggests the material deformation at a constant pace before the fracture. All the three samples (bare aluminum thin foil specimens) deliberately showed the same pattern with 1.9 mm maximum deflection. Fig.2 represents the load-deflection behavior of bare al foils.
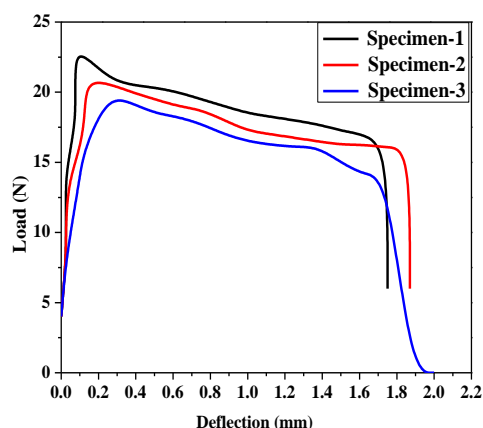

Fig.2 FML: Load V/s Deflection Plot

The tensile tests conducted on FML with epoxy showed slightly varied pattern. It is observed gradual rise in the load values and a shorter plateau region suggesting the mixed behavior (ductile & brittle). Fig.3 represents the load-deflection behavior of bare al foils in epoxy matrix system. The maximum deflection of 1.3 mm i.e., 31% drop in the stretch of the specimens noted and is shown in below figure 3.
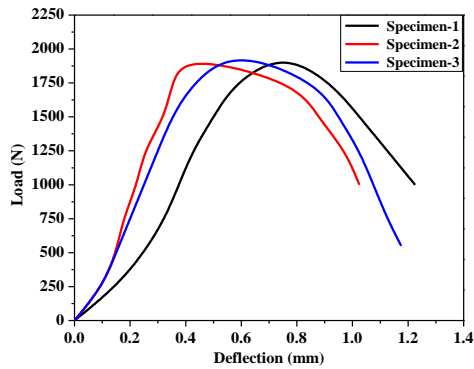
Fig.3 FML + Epx: Load V/s Deflection

Figure 4 and Figure 5 indicates the load deflection behavior of the FML composites with chopped strand mat (CSM) and woven roving (WR) mats. The behavior in both the cases seems to be similar indicates the integrity of the combination of the fibres and aluminum foils during the test.

The WR FML composites showed 74% increased strength than the bare foil FML's. But it is observed that only a mere of 7% variation in the load carrying behavior of the fibre reinforced FML's with the change of fibres. No much changes observed in terms of elongation and modulus.

The Fig.4 and Fig. 5 represents the load-deflection behavior of FML's with varying fibre types.
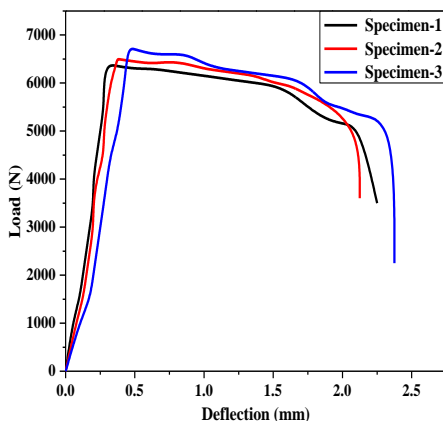
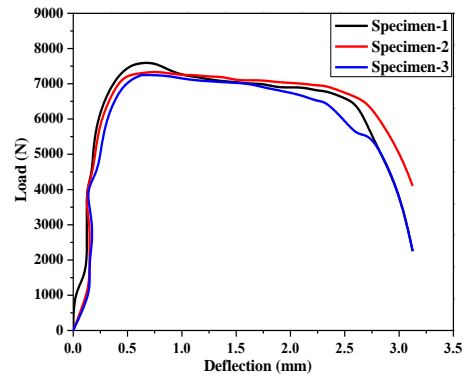Fig.4 CSM+Al FML: Load V/s Deflection

Fig.4 WR+Al FML: Load V/s Deflection

Tensile failure of these FML's laminates involves the release of a large amount of elastic energy by breaking fibers and by debonding. The delamination also found to occur at metal fibre interface. Tensile failure is accompanied by partial disintegration of the fibre layer, which fractures into large fragments upon failure. Inspection of the peeled FML specimens revealed that about 75% of the delamination area was at the fiber/adhesive interfaces, and the remainder was at the adhesive/aluminum primer interface. The results showed in the study indicate that there can be substantial improvements with combining thin aluminum foils in composites.

IV. CONCLUSION

➢ Fibre metal laminated composites comprising of thin aluminum foils with varied E-glass fibre architecture were successfully characterized and the following conclusions were drawn.

➢ The load-deflection and the failure behavior observed witnessed ductile and ductile brittle combinations.

➢ The specimens showed an increase of 70% load bearing capacity with the fibre impregnation.

➢ There is an increase of 41% modulus shows good compatibility.

➢ The test specimens revealed 63% increase in ultimate tensile strength and 34% increase in yield strength suggests flawless synthesis of the FML composites.

The Viability of FML fabrication procedure is proved and the quality of interfaces between two different E-glass fibre architectures with thin aluminum foil found to be good.

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Machine Learning Model Building for Predicting Roughness of Prototype built using Rapid Prototyping

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ABSTRACT

Linear Regression is one the most common algorithm for prediction of continuous response variables. But the accuracy with the prediction is less because of the multi collinearity effects involved in the model. In the case study presented a dataset on predicting the roughness of a rapid prototype is done using multi linear regression model building. The accuracy of the prediction is increased by removing the effects of multi collinearity from the model.

Keywords : Multi Linear Regression, Multi- Collinearity

I. INTRODUCTION

Machine learning is one of the fastest growing interdisciplinary areas of Engineering, with wide range of applications. The project aims to introduce machine learning, and the algorithmic paradigms it offers, in a principled way. It is one of the technique from which computers can learn from input available to them. The algorithm learns by the input data we are giving which inturn represents an experience on a particular task. The learning depends majorly of the data we have collected. We are trying to study particular pattern a data is exhibiting. So the data collection has to be genuine.

MULTIPLE LINEAR REGRESSION IN MACHINE LEARNING:

Regrssion problems are an important category of problems in analytics in which the response variable (Y) takes a continuous value. Multiple linear regression means linear in regression parameters (beta values). The following is the examples of multiple linear regression:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_k X_K$$

Ordinary Least Squares Estimation for Multiple Linear Regression

The assumptions that are made in multiple linear regression model are as follows:

- The regression model is linear in parameter.
- The explanatory variable, X, is assumed to be non-stochastic (that is, X is deterministic).
- The conditional expected value of the residuals, $E(\varepsilon_i/X_i)$, is zero.
- In a time series data, residuals are uncorrelated, that is, $\text{Cov}(\varepsilon_i, \varepsilon_j) = 0$ for all $i \neq j$.
- The residuals, ε_i, follow a normal distribution.
- The variance of the residuals, $\text{Var}(\varepsilon_i/X_i)$, is constant for all values of X_i. When the variance of the residuals is constant for different values of X_i, it is called **homoscedasticity**. A non-constant variance of residuals is called **heteroscedasticity**.
- There is no high correlation between independent variables in the model (called **multi-collinearity**). Multi-collinearity can destabilize the model and can result in incorrect estimation of the regression parameters.

The regression coefficients β is given by

$$\hat{\beta} = (\mathbf{X^TX})^{-1}\mathbf{X^TY}$$

The estimated values of response variable are

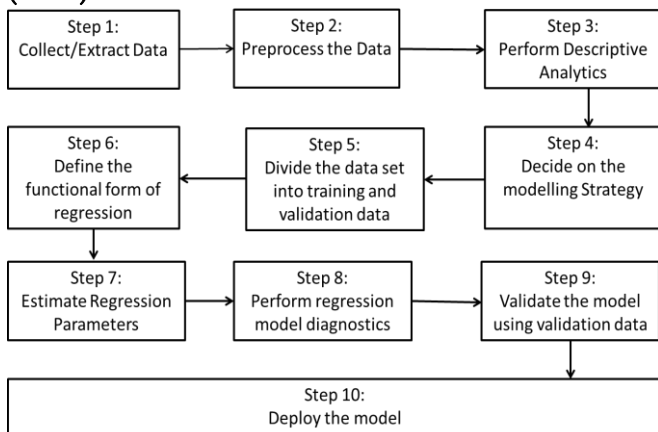$$\hat{\mathbf{Y}} = \mathbf{X}\hat{\beta} = \mathbf{X(X^TX)^{-1}X^TY}$$

In above Eq. the predicted value of dependent variable is a linear function of Y_i. Equation can be written as follows:

$$\mathbf{H} = \mathbf{X(X^TX)^{-1}X^T}$$

is called the **hat matrix**, also known as the **influence matrix**, since it describes the influence of each observation on the predicted values of response variable

Framework for building multiple linear regression (MLR).

II. Experiment

Model Building:

The variables available for the evaluation of 'Roughness' are 'layer_height', 'wall_thickness','infill_density','infill_pattern','nozzle_temperature','bed_temperature','print_speed','material','fan_speed'

A total of **50 observations** were recorded.

```python
import pandas as pd
import numpy as np
```

```python
RAPID_PROT_PRINT = pd.read_csv(r"C:\Users\dell\Desktop\Current\Mach
```

```
RAPID_PROT_PRINT.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 50 entries, 0 to 49
Data columns (total 12 columns):
layer_height          50 non-null float64
wall_thickness        50 non-null int64
infill_density        50 non-null int64
infill_pattern        50 non-null object
nozzle_temperature    50 non-null int64
bed_temperature       50 non-null int64
print_speed           50 non-null int64
material              50 non-null object
fan_speed             50 non-null int64
roughness             50 non-null int64
tension_strenght      50 non-null int64
elongation            50 non-null float64
dtypes: float64(2), int64(8), object(2)
memory usage: 4.8+ KB
```



```python
X_features=RAPID_PROT_PRINT.columns
print(X_features)
```
```
Index(['layer_height', 'wall_thickness', 'infill_density', 'infill_pattern',
       'nozzle_temperature', 'bed_temperature', 'print_speed', 'material',
       'fan_speed', 'roughness', 'tension_strenght', 'elongation'],
      dtype='object')
```

```python
X_features = ['layer_height','wall_thickness','infill_density','infill_pattern','nozzle_temperature','bed_temperature','print_spee
```

```python
RAPID_PROT_PRINT['infill_pattern'].unique()
```
```
array(['grid', 'honeycomb'], dtype=object)
```

```python
categorical_features=['infill_pattern','material']
```

```python
RAPID_PROT_PRINT_encoded=pd.get_dummies(RAPID_PROT_PRINT[X_features],columns=categorical_features,drop_first=True)
```

```python
RAPID_PROT_PRINT_encoded
```

```python
X_features = RAPID_PROT_PRINT_encoded.columns
print(X_features)
```
```
Index(['layer_height', 'wall_thickness', 'infill_density',
       'nozzle_temperature', 'bed_temperature', 'print_speed', 'fan_speed',
       'infill_pattern_honeycomb', 'material_pla'],
      dtype='object')
```

```python
from sklearn.model_selection import train_test_split
import statsmodels.api as sm
X=sm.add_constant(RAPID_PROT_PRINT_encoded)
Y=RAPID_PROT_PRINT['roughness']
train_X,test_X,train_Y,test_Y=train_test_split(X,Y,train_size=0.8,random_state=42)
```

```python
RAPID_PROT_PRINT_model=sm.OLS(train_Y,train_X).fit()
```

```python
RAPID_PROT_PRINT_model.summary()
```

OLS Regression Results

Dep. Variable:	roughness	**R-squared:**	0.881
Model:	OLS	**Adj. R-squared:**	0.851
Method:	Least Squares	**F-statistic:**	28.79
Date:	Wed, 18 Dec 2019	**Prob (F-statistic):**	2.79e-12
Time:	11:10:49	**Log-Likelihood:**	-199.87
No. Observations:	40	**AIC:**	417.7
Df Residuals:	31	**BIC:**	432.9
Df Model:	8		

|	coef	std err	t	P>|t|	[0.025	0.975]
const	-0.8641	0.186	-4.645	0.000	-1.243	-0.485
layer_height	1257.5903	100.569	12.505	0.000	1052.478	1462.703
wall_thickness	2.4151	2.555	0.945	0.352	-2.796	7.626
infill_density	-0.0205	0.272	-0.075	0.940	-0.575	0.534
nozzle_temperature	13.6205	2.968	4.589	0.000	7.567	19.674
bed_temperature	-50.3923	10.881	-4.631	0.000	-72.583	-28.201
print_speed	0.6742	0.239	2.820	0.008	0.187	1.162
fan_speed	7.2580	1.423	5.099	0.000	4.355	10.161
infill_pattern_honeycomb	-5.8959	13.531	-0.436	0.666	-33.492	21.700
material_pla	265.9751	69.087	3.850	0.001	125.071	406.879

```python
import matplotlib.pyplot as plt
import seaborn as sn
```

```python
RAPID_PROT_PRINT_resid=RAPID_PROT_PRINT_model.resid
probplot=sm.ProbPlot(RAPID_PROT_PRINT_resid)
probplot.ppplot(line='45')
plt.show()
```
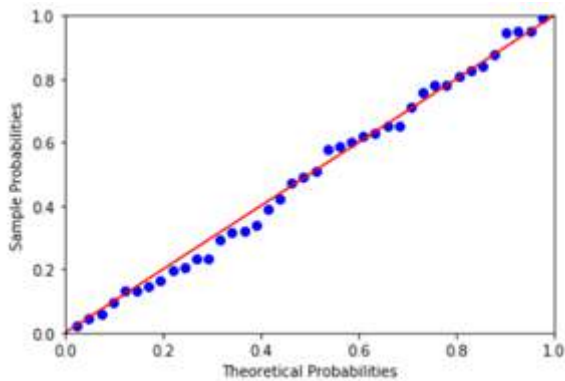


```python
def get_standardized_values(vals):
    return (vals-vals.mean())/vals.std()
```

```python
plt.scatter(get_standardized_values(RAPID_PROT_PRINT_model.fittedvalues),get_standardized_values(RAPID_PROT_PRINT_resid))
plt.xlabel("standardized predicted values")
plt.ylabel("standardized residuals")
```
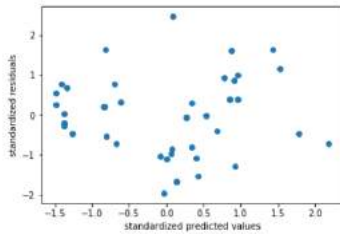


```python
from statsmodels.stats.outliers_influence import variance_inflation_factor
def get_vif_factors(X):
    X_matrix=X.values
    vif=[variance_inflation_factor(X_matrix,i) for i in range (X_matrix.shape[1])]
    vif_factors=pd.DataFrame()
    vif_factors['column']=X.columns
    vif_factors['VIF']=vif
    return vif_factors
```

	column	VIF
0	layer_height	1.067264
1	wall_thickness	1.371753
2	infill_density	1.180562
3	nozzle_temperature	47.060693
4	bed_temperature	14577.380876
5	print_speed	1.253881
6	fan_speed	196.700154
7	infill_pattern_honeycomb	1.087609
8	material_pla	29.112041

```python
columns_with_large_vif=vif_factors[vif_factors.VIF>4].column
```

```python
import matplotlib.pyplot as plt
import seaborn as sn
plt.figure(figsize=(20,10))
sn.heatmap(X[columns_with_large_vif].corr(), annot=True);
plt.title("Heatmap depicting correlation between features");
```


Heatmap depicting correlation between features
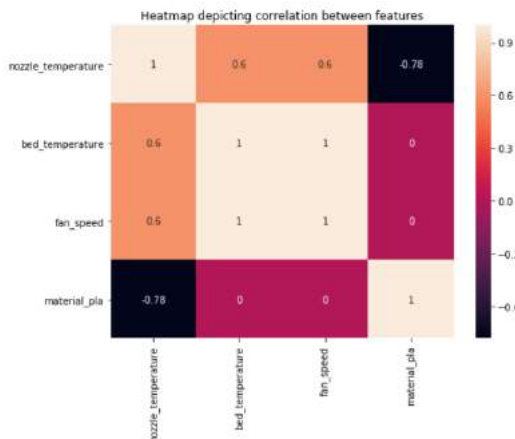
```python
columns_to_be_removed=["nozzle_temperature","bed_temperature"]
```

```python
X_new_features=list(set(X_features)-set(columns_to_be_removed))
```

```python
get_vif_factors(X[X_new_features])
```

	column	VIF
0	layer_height	3.188074
1	print_speed	4.042519
2	fan_speed	2.771714
3	wall_thickness	3.998287
4	infill_density	4.989614
5	infill_pattern_honeycomb	2.137185
6	material_pla	2.185480

```python
train_X=train_X[X_new_features]
RAPID_PROT_PRINT_2=sm.OLS(train_Y,train_X).fit()
RAPID_PROT_PRINT_2.summary()
```

OLS Regression Results

Dep. Variable:	roughness	R-squared:	0.944
Model:	OLS	Adj. R-squared:	0.932
Method:	Least Squares	F-statistic:	78.76
Date:	Wed, 18 Dec 2019	Prob (F-statistic):	9.45e-19
Time:	11:16:52	Log-Likelihood:	-210.58
No. Observations:	40	AIC:	435.2
Df Residuals:	33	BIC:	447.0
Df Model:	7		

	coef	std err	t	P>|t|	[0.025	0.975]
layer_height	1226.9310	117.289	10.461	0.000	988.305	1465.557
print_speed	0.4514	0.233	1.941	0.061	-0.022	0.924
fan_speed	0.6716	0.233	2.888	0.007	0.199	1.145
wall_thickness	0.9515	2.718	0.350	0.729	-4.578	6.481
infill_density	0.0840	0.301	0.279	0.782	-0.528	0.696
infill_pattern_honeycomb	-14.8142	16.957	-0.874	0.389	-49.314	19.686
material_pla	-47.9192	16.855	-2.843	0.008	-82.210	-13.628

Omnibus:	3.064	Durbin-Watson:	1.643
Prob(Omnibus):	0.216	Jarque-Bera (JB):	2.658
Skew:	0.533	Prob(JB):	0.265
Kurtosis:	2.324	Cond. No.	1.49e+03

III. Conclusion

The most significant factors after removing multi-collinearity are "Layer_height". The model has an R-Square value of 0.715. The model also satisfies the normality condition.

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Fabrication and Study of the Effect of Flyash on Aluminium 2024 Composite

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ABSTRACT

Al-alloys are widely used application due to their low density, good mechanical properties, better corrosion resistance, wear resistance as compared to conventional metals and alloys. Fly ash is chosen because of it is least expensive and low density reinforcement available in large quantities as solid waste by-product during manufacturing of bricks. Due to low weight it can be utilized in automobile application and thus improving its life. The present work has been done on Al alloy 2024 Fly ash composite. These were fabricated using Al-2024 alloy as metal matrix and fly ash as reinforcing material. Various weight based composites like (Al 100% - FA 0%), (Al 95% - FA 5%), (Al 90% - FA 10%), (Al 85% - FA 15%) were fabricated by Stir casting technique. The obtained composites were sized into small specimens and tests like hardness test, wear test, tensile test, microstructure test were carried out.

Keywords : Composite, Fly ash, Al - 2024, Wear, Hardness, Tensile, Microstructure.

I. INTRODUCTION

ALUMINIUM 2024:

Aluminium alloy 2024 has a thickness of 2.78 g/cm³ (0.1 lb/in³). Electrical conductivity of 30% IACS. Young's Modulus of 73 GPa (10.6 Msi) over all tempers. 2024 aluminium amalgam's creation generally incorporates 4.3-4.5% copper, 0.5-0.6% manganese, 1.3-1.5% magnesium and not exactly a large portion of a percent of silicon, zinc, nickel, chromium, lead and bismuth. It has an extreme elasticity of 140– 210 MPa (21– 30 ksi), and most extreme yield quality of close to 97 MPa (14,000 psi).

FLYASH :

Fly ash particles are generally spherical in shape and range in size from 0.5 μm to 300 μm. Fly ash is a heterogeneous material. SiO_2, Al_2O_3, Fe_2O_3 and occasionally CaO are the main chemical components present in fly ashes. Two classes of fly ash are defined by ASTM C618: Class F fly ash and Class C fly ash. Fly ash can be dark gray, depending on its chemical and mineral constituents. Tan and light colors are typically associated with high lime content. Fly ash color is very consistent for each power plant and coal source.

Table.1 Composition of Flyash

Sl. No.	Composition	Percentage
1	SiO_2	60.21
2	Al_2O_3	26.08
3	Fe_2O_3	4.80
4	CaO	1.00
5	MgO	0.25
6	Total alkali as Na_2O	0.86
7	SO_3	0.25
8	Cl	0.005
9	LOI(Loss in Ignition)	1.71

Fig.1 Flyash

ROCKWELL HARDNESS TEST:

Rockwell hardness of a Specimen involves application of a minor load followed by major load. The minor load resets to zero position. Major load is applied, then removed while maintaining minor load. Depth of penetration from the zero position is measured on a dial, in which a harder surface gives a much higher hardness number. The advantage of Rockwell hardness is that it displays the hardness values directly. Readings to be taken on a flat surface, as convex surfaces gives error readings.

WEAR ANALYSIS (PIN-ON-DISC):

In a pin-on-disc wear tester, a Specimen is loaded on a flat rotating disc in a way that the circular wear path by the machine is followed. The machine is used to evaluate various wear and friction properties for different materials under pure sliding.
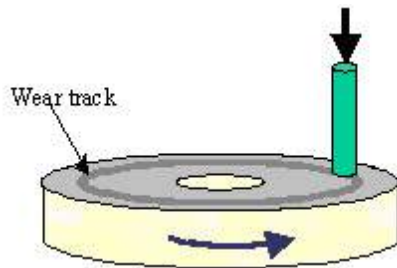
Fig.2 Pin on Disc analysis

TENSILE TEST:

This is a fundamental material test in which a sample is subjected to controlled tension until failure, it has maximum elongation and reduction in area. Properties that are directly measured via tensile test are ultimate tensile strength.

Samples were machined and tested as per ASTM E8 standard. Bench tensometer was the device used to test the tensile strength. The electronic Tensometer is a compact and bench model horizontal Tensile Testing Machine of capacity 20 KN. It is a small version of UTM- Universal Testing Machine and is used for testing tension and also compression, shear and flexural properties of different materials.

Table.2 Specimen composition

Specimen	Aluminium 2024 (wt %)	Flyash (wt %)
Specimen 1	100%	0%
Specimen 2	95%	5%
Specimen 3	90%	10%
Specimen 4	85%	15%

II. EXPERIMENTAL RESULTS AND DISCUSSION

WEAR TEST:

Table 3 Wear test results

COMPOSITION	SPEED (RPM)	LOAD (N)	TIME (min)	WEIGHT (gm)			WEAR RATE (gm/mm)
				INITIAL	FINAL	WT. LOSS	

0%	600	9.81	5	3.2638	3.2614	0.0024	$2.4047*10^{-6}$
	500	19.613	5	3.2614	3.2535	0.0079	$9.4940*10^{-6}$
5%	600	9.81	5	2.5267	2.5140	0.0127	$1.2718*10^{-5}$
	500	19.613	5	2.5140	2.5042	0.0098	$1.1777*10^{-5}$
10%	500	19.613	5	2.5829	2.5076	0.0753	$4.2920*10^{-7}$
	500	19.613	5	2.5076	2.5058	0.0018	$8.0969*10^{-5}$
15%	500	19.613	5	3.0202	3.0032	0.0017	$2.060*10^{-6}$
	500	19.613	5	3.0032	2.9859	0.0173	$1.4571*10^{-5}$

TENSILE TEST:

Table 4 Tensile test results

Sl.no	PARAMETERS	SPECIMEN			
		1	2	3	4
1	Initial area, (mm²)	32.68	32.68	32.68	32.68
2	Initial gauge length, (mm)	25	25	25	25
3	Peak load, (N)	5555.8	5065.4	5845.8	6119.8
4	Engineering Ultimate Tensile strength, (MPa)	174.2	160.7	185.8	190.8
5	True Ultimate Tensile strength, (MPa)	210.9	182.00	222.8	284.1

HARDNESS TEST:

Table 5 Hardness Test Results

COMPOSITION (Flyash)	APPLIED LOAD (Kg)	BRINELL HARDNESS NUMBER
0%	100	90.59
5%	100	113.162
10%	100	143.41
15%	100	153.162

MICROSTRUCTURE EXAMINATION:

The microstructure observations of the casted specimens are as shown below. The microstructures show the distribution of Flyash particles.
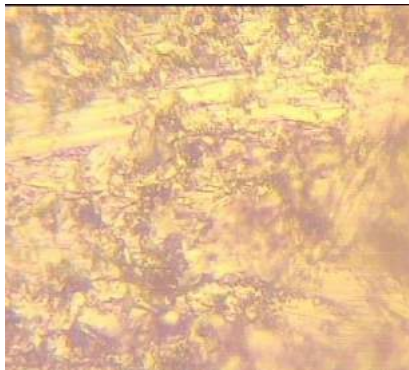
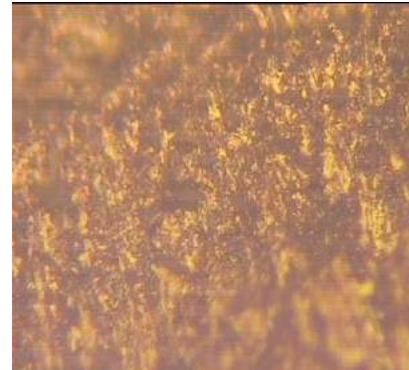The grain boundaries are visible and no porosity is seen.
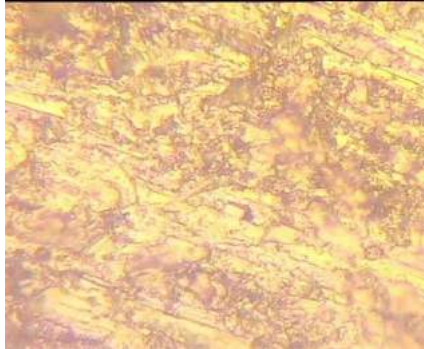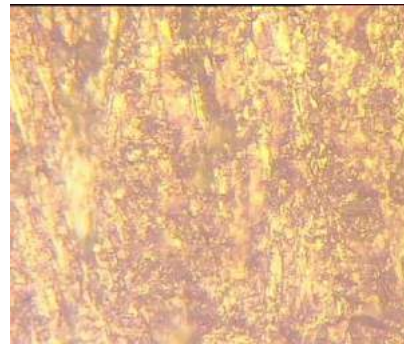
SPECIMEN 1

SPECIMEN 2

SPECIMEN 3

SPECIMEN 4

I. CONCLUSIONS

Al 2024 with flyash composite was synthesized successfully by using stir casting technique. By adding flyash the strength of al 2024 alloy gets improved. This is due to the presence of hardened fly ash particles and oxides.

The reinforced Al2024 exhibits higher tensile strength.

The hardness values increased compared to the pure alloy without reinforcement and specimen 4 was found to have the highest hardness number.

The reinforced composites were found to have less wear loss compared to the base alloy.

Microstructure evaluation showed dispersion of the reinforcements in the specimens.

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Study & Experimentation about machinability of Al-7075 composite

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ABSTRACT

Metal matrix composites have received considerable attention due to their excellent engineering properties. These materials are difficult to machine because of their hardness and abrasive nature of reinforcement particles. This paper presents experimental work from a series of turning tests in which carbide tool and polycrystalline diamond (PCD) tools were used to machine E-glass and tungsten carbide reinforced Al-7075 hybrid composite. The influence of machine parameters e.g., cutting speed, feed, and depth of cut on the surface roughness, cutting forces, tool wear and tool life were investigated. In the present study, an attempt has been made to investigate the influence of cutting speed, depth of cut, and feed rate on surface roughness during machining of 7075 Al alloy and 4% tungsten carbide and E-glass reinforced particulate metal-matrix composites. The experiments were conducted on a CNC Turning Machine using tungsten carbide and polycrystalline diamond (PCD) inserts.

Keywords : Composite, Fly ash, Al - 2024, Wear, Hardness, Tensile, Microstructure.

I. INTRODUCTION AND LITERATURE REVIEW

Metal matrix composites are formed by combination of metal matrix and stiff and hard reinforcing phase. These materials are difficult to machine because of their hardness and abrasive nature of reinforced particles.In the last decades, WC/Al composites have been increasingly used in the aerospace industry and advanced arm systems such as satellite bearing, inertia navigation system, and laser reflector. Particulate metal-matrix composites (PMMCs) are most commonly manufactured by a stir-casting technique or powder metallurgy technique [1]. Stir casting is the simplest and the most commercial technique. The development of MMCs by stir-casting technology has been one of the unique and feasible processes because of producing better matrix–particle bonding, easier control of matrix structure, simplicity, higher production rate, and low cost [2].

It involves stirring the melt along with solid silicon carbide particles and then allowing the mixture to solidify. Due to the addition of reinforcing materials, which are normally harder and stiffer than matrix, machining becomes significantly more difficult than those of conventional materials [3].

LM 25 aluminum alloy reinforced with green bonded silicon carbide particles of size 25 μm with different volume fractions was used for experimentation. The machining experiments were conducted on the lathe using tungsten carbide tool inserts (K10). It was concluded that feed rate has the greater influence on surface roughness, followed by cutting speed and percent volume fraction of WC [4]. Investigation on the wear of polycrystalline diamond (PCD) and polycrystalline cubic boron nitride (PCBN) tools in the machining of Al-WC MMC (9.27 Si, 0.15 Fe, 0.55 Mg, Al balance) 5% volume WC, particle size 12.8

μm was carried out by turning. The binder less PCBN tools showed the highest fracture resistance. PCD tool exhibited higher wear resistance than PCBN tools and lower propensity for work material adhesion. During machining with PCBN tools without coolant, the severity of transfer material on the tools increased significantly with cutting speed. The adhesion property of the tool and the work material, apart from the tool wear, appeared to have a major influence on the surface finish [5].

LM6 Mg15 WC-Al-metal matrix composite, as casted with average particle size 23 μm, was used as composite material. Different sets of experiments were performed on a combination turret lathe. Uncoated tungsten carbide (WC; HW-K10) insert was used for turning. Results indicated that cutting speed, feed rate, and depth of cut are having equal influence on the surface roughness characteristics, i.e., Ra and Rt. High speed, low feed rate, and low depth of cut was recommended for achieving better surface finish during turning of Al/WC-MMC using tungsten carbide insert [6].

Rods of Al Si 7 Mg2 material reinforced with 5, 10, and 15 wt.% of WC of particle size 30–60 μm were produced, 90 mm in diameter and 150 mm in lengthInfluence of feed rate was not as effective as cutting speed on tool wear, but as the feed rate increased, the wear of cutting tool also increased. In turning of AlSi7Mg2-MMC samples, surface quality improved when cutting speed decreased. Surface roughness increased due to increasing feed. It was found that increase in particle ratio affects roughness negatively [7].

An experimental investigation was conducted on the machinability of fabricated aluminum metal matrix composite LM-25 (A356/WC/10p) during continuous turning of composite rods using medium grade polycrystalline diamond (PCD 1500) inserts. Cutting conditions and parameters such as surface roughness, specific power consumed, and tool wear were measured. The steady low values of Ra and Rz at a

cutting speed of 400 m/min over the entire tool life span makes high speed finishing of MMC possible [8]. Work dealt with the surface integrity of machined Al 4% WC PMMCs. Dry high-speed turning tests at different cutting speeds, feed rates, and depths of cut were conducted in order to investigate their effect on the surface quality and the extent of the sub-surface damage due to machining. The cutting tests were carried out using PCD tools. It was found that machining of this type of composite is most economical and safe at a speed of 894 m/min, a depth of cut of 1.5 mm, and feed rates as high as 0.45 mm/rev, when the surface roughness (R_{max}) did not exceed 2.5 μm [9].

In this study, A356 homogenized 5 wt.% WC (average particle size 24 μm) aluminum MMC material was selected for an experimental investigation of tool wear and surface roughness. Two types of K10 cutting tool (uncoated and TiN-coated) were used at different cutting speeds (50, 100, and 150 m/min), feed rates (0.1, 0.2, and 0.3 mm/rev), and depths of cut (0.5, 1.0, and 1.5 mm). In dry turning condition, tool wear was mainly affected by cutting speed. It decreased tool wear and provided smoother surface finish. Homogenized heat treatment affected material adversely, it increased tool wear and surface roughness [10].

From the available literature on particulate metal-matrix composites, it is clear that the morphology, distribution and volume fraction of the reinforcement phase, as well as the matrix properties are the factors that affect the overall cutting process. So far no work has been reported about the machining of 7075 Al alloy and 4 wt.% WC and E-Glass composite using tungsten carbide and PCD inserts to assess surface roughness and tool wear.

The cost of PCD tools increase the cost of production so it is necessary to carry out basic machinability studies in order to find cutting conditions using tungsten carbide tools, which can result in high productivity at low cost. In the present work,

optimum values of cutting speed, feed rate, and depth of cut have been found out to attain minimum surface roughness during the turning of 7075 Al alloy with 4 wt.% WC and E-glass composite using tungsten carbide inserts and PCD inserts. Wear of tungsten carbide and PCD inserts have been found out and the causes of wear have been analyzed.

II. Experimental Setup

Stir casting process was used to fabricate the 7075 Al alloy and 4 wt.% WC and E-glass composites. Figure 1shows the microstructure of the cast Al alloy and WC and E-glass composite before the machining operation was performed.

The experiments were performed on 7075 Al alloy and composites. The diameter and length of the workpiece material are 27 and 100 mm, respectively.Details of inserts and tool holders are given in Table 1.

Table 1: Cutting tools used in experiment

Turning tool Holder	Type of insert	Clearance angle (degree)	Back rake angle (degree)	Nose radius (r; mm)	Feed (f; mm/rev)	Depth of cut (mm)
PCLNL 2525 M12 KT 809	Carbide insert CNMG 120408EM grade 6630	0°	7°	0.8	$f_{min}=0.15$; $f_{max}=0.60$	$a_{pmin}=1.0$; $a_{pmax}=6.0$
SVJBL 2525 M16 WIDAX	PCD Insert VCMW 160404 FN	7°	0°	0.4	$f_{min}=0.10$; $f_{max}=0.14$	$a_{pmin}=0.4$; $a_{pmax}=2.0$

⊢——|100μm 100X   ⊢——|100μm 100X
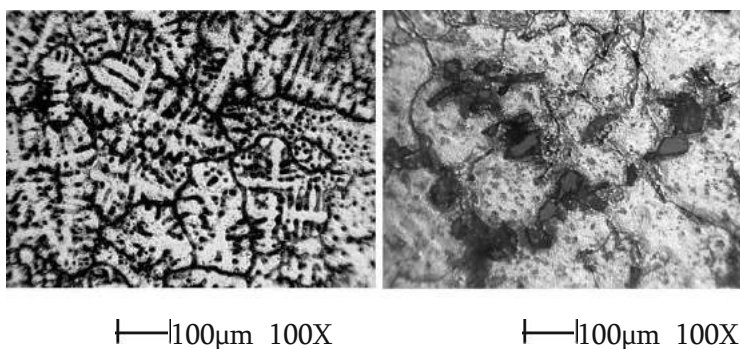
Fig. 1. a, b Microstructure of 7075 aluminum alloy and reinforced composite

CNC Turning Machine (Model TC 20) was used for experiments. The machine parameters are given in Table 2.

TABLE 2.CNC TURNING MACHINE PARAMETERS

Parameter	Specifications
Distance between centers	575mm
Swing over telescopic cover	500mm
Spindle speed range	40–4,000rpm

Positioning accuracy	
X-axis	±0.005 mm
Z-axis	±0.0075mm
Main motor	7.5KW

After turning, the surface roughness was measured using the Gippan SRT-6210, a portable surface roughness instrument. The cut-off and sampling lengths for each measurement were taken as 0.8 and 4 mm, respectively. Driving speed of stylus was taken as 0.5 mm/rev. ISO 4287 standard was followed during measurement. On each specimen, three surface roughness measurements were made along the machined surface and an average of these values was taken as a response. A small portion of size 12 mm ×12 mm was cut with a hacksaw from each specimen to analyze the machined surface microstructure using a LEICA DFC 420 optical microscope.

TABLE 3: VALUES OF SURFACE ROUGHNESS OF THE WORK PIECES MACHINED USING CARBIDE INSERTS

Material	Feed (mm/rev)	Depth of Cut (mm)	Cutting speed (m/min)	Average rurface roughness (R_a; μm)
7075 Al alloy	0.1	0.5	180	4.015
			200	3.921
			220	3.869
			240	3.619
	0.2	1.0	180	4.198
			200	3.917
			220	3.825
			240	3.722
	0.3	1.5	180	4.809
			200	4.713
			220	4.605
			240	4.524
	0.4	2.0	180	5.967
			200	5.858
			220	5.746
			240	5.639
7075 Al alloy 4 wt.% WC and E-glass composite	0.1	0.5	180	4.327
			200	4.172
			220	4.069
			240	3.926
	0.2	1.0	180	4.439
			200	4.287
			220	4.176
			240	4.053

	Feed (mm/rev)	Depth of Cut (mm)	Cutting Speed (m/min)	Average surface roughness (R_a; μm)
	0.3	1.5	180	5.347
			200	5.234
			220	5.128
			240	5.019
	0.4	2.0	180	6.217
			200	6.131
			220	6.018
			240	5.911

Material	Feed (mm/rev)	Depth of Cut (mm)	Cutting Speed (m/min)	Average surface roughness (R_a; μm)
7075 Al alloy	0.1	0.5	180	2.729
			200	2.605
			220	2.521
			240	2.402
	0.2	1.0	180	2.837
			200	2.726
			220	2.618
			240	2.509
	0.3	1.5	180	3.215
			200	3.107
			220	2.987
			240	2.876
	0.4	2.0	180	3.625
			200	3.519
			220	3.427
			240	3.318
7075 Al alloy 4 wt% WC and E-glass composite	0.1	0.5	180	2.838
			220	2.652
			240	2.507
	0.2	1.0	180	2.941
			200	2.835
			220	2.739
			240	2.618
	0.3	1.5	180	3.538
			200	3.441
			220	3.322
			240	3.214

	0.4	2.0	180	3.987
			200	3.851
			220	3.728
			240	3.611

TABLE 4: VALUES OF SURFACE ROUGHNESS OF THE WORK PIECES MACHINED USING PCD INSERTS

III. Results And Discussion

Surface roughness:

Surface roughness plays an important role in many areas and is a factor of great importance in the evaluation of machining accuracy. Many factors affect the surface condition of a machined part. But machining parameters such as cutting speed, feed rate, and depth of cut have a significant influence on the surface roughness for a given cutting tool and workpiece setup. Values of surface roughness at different cutting speed, feed rate, and depth of cut using carbide and PCD inserts are shown in Tables 4 and 5, respectively.

Figures 2and 3show the values of surface roughness at different feed rates, cutting speeds, and depth of cuts while turning Al alloy and WC and E-Glass composite, respectively, using carbide inserts. Surface roughness of Al alloy decreases by 5.49% with the increase of cutting speed from 180 to 240 m/min at a feed rate of 0.4 mm/rev. Surface roughness of Al alloy is almost same at cutting speeds of 200 and 220 m/min when feed is increased from 0.1 to 0.2 mm/rev. On the other hand, surface roughness of WC and E-Glass composite decreases by 4.92% with the increase of cutting speed from 180 mm/min to 240 mm/min at feed rate of 0.4 mm/rev. Surface roughness of WC and E-Glass composite is higher than Al alloy at all machining parameters.
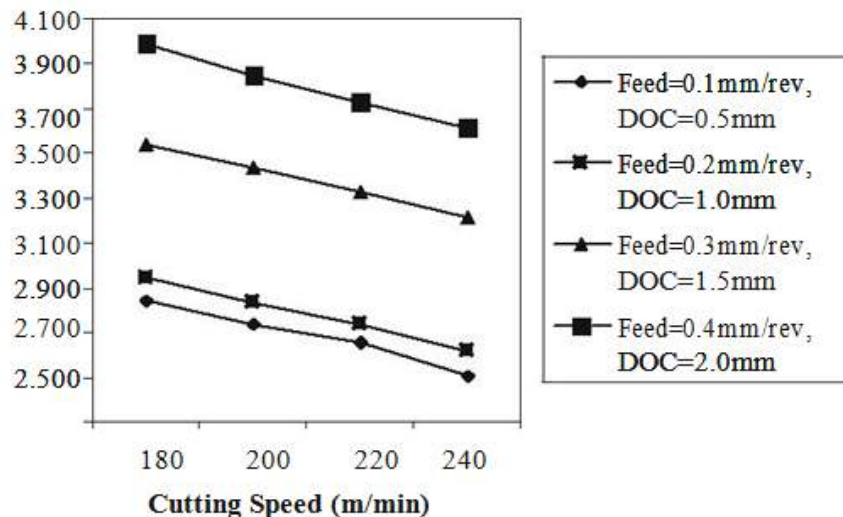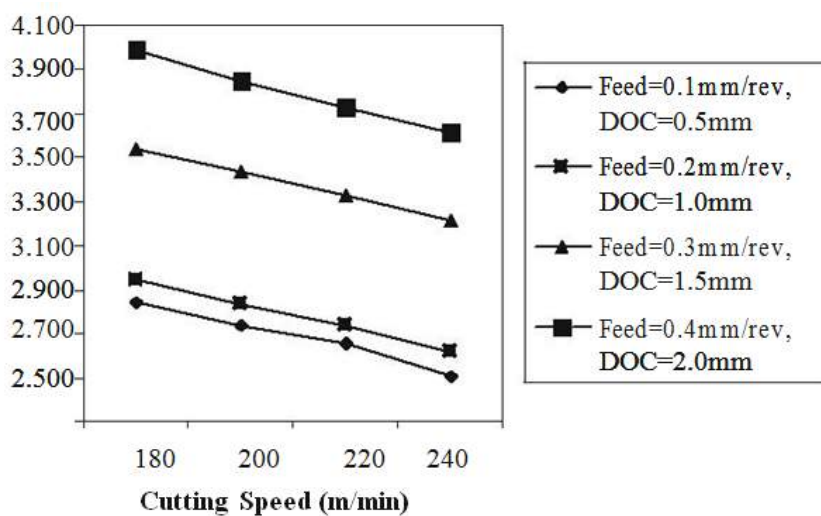

Fig. 2. Variation of surface roughness WC and E-Glass composite using carbide insert
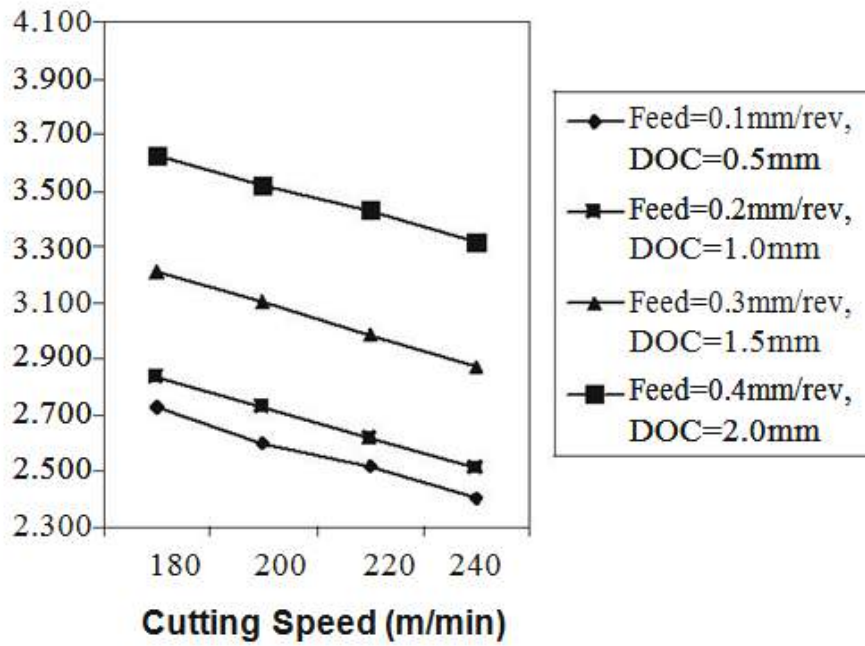
Fig. 3. Variation of surface roughness of Al alloy using carbide insert

Figures 4and 5indicate the value of surface roughness at different feed rates, cutting speeds, and depth of cuts while turning Al Alloy and WC and E-Glass composite, respectively, using PCD inserts. Surface roughness of Al alloy decreases by 8.46% with the increase of cutting speed from 180 to 240 m/min at a feed rate of 0.4 mm/rev.

Decrease in surface roughness is gradual for Al alloy at all feed rates and depth of cuts considered in the experiments, when cutting speed is increased from 180 to 240 mm/min. Surface roughness of composite decreases by 9.43% with the increase of cutting speed from 180 to 240 mm/min at feed rate of 0.4 mm/rev. Surface roughness of both Al alloy and WC and E-Glass composite decreases when using PCD insert as compared to the carbide insert.

Fig. 5. Variation of surface roughness of WC and E-Glass composite using PCD insert
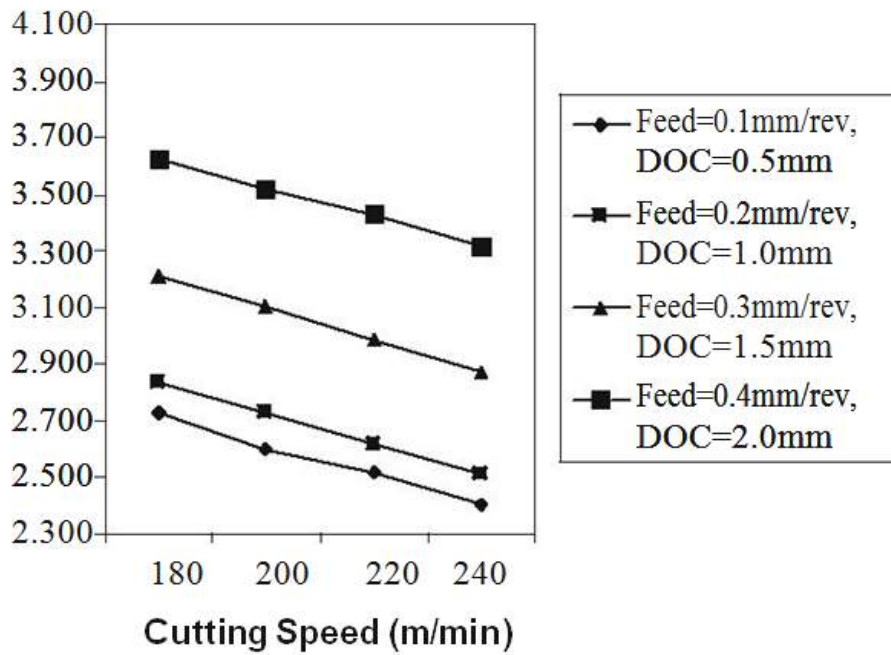
Fig. 4. Variation of surface roughness of Al alloy using PCD insert

In Figs. 6and 7, surface roughness is examined during turning of Al alloy and WC and E-Glass composite, respectively, by using carbide inserts at feed rates of 0.1, 0.2, 0.3, and 0.4 mm/rev. Surface roughness of Al alloy is almost constant at cutting speed of 200 and 220 mm/min when feed is increased from 0.1 to 0.2 mm/rev and DOC from 0.5 to 1.0 mm. Surface roughness of Al alloy increases by 55.81% with the increase of feed from 0.1 to 0.4 mm/rev and DOC from 0.5 to 2.0 mm at cutting speed of 240 m/min. Surface roughness of WC and E-Glass composite increases gradually with the increases of feed from 0.1 to 0.2 mm/rev and DOC from 0.5 to 1.0 mm at all cutting speeds. Surface roughness of WC composite increases by 50.56%, with the increase of feed from 0.1 to 0.4 mm/rev and DOC from 0.5 to 2.0 mm, at cutting speed of 240 m/min.
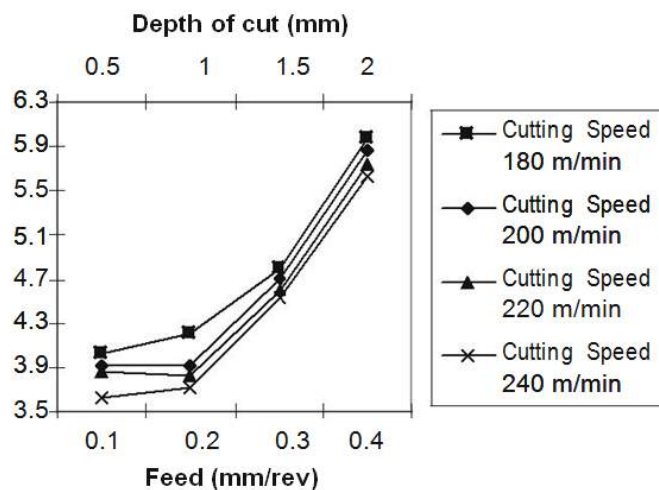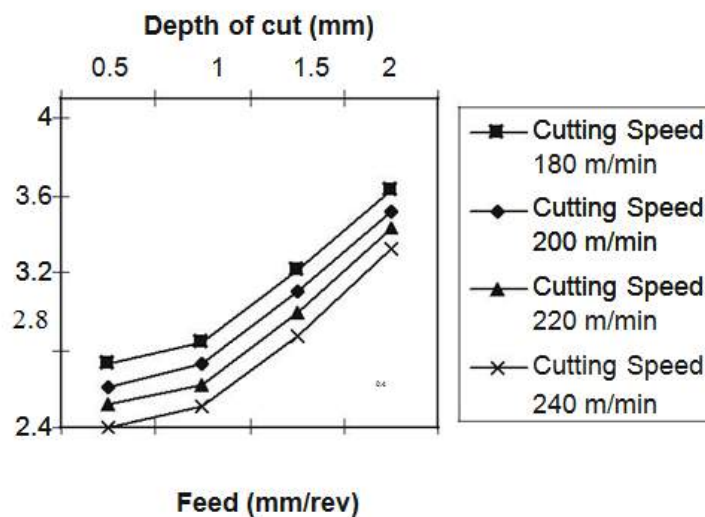

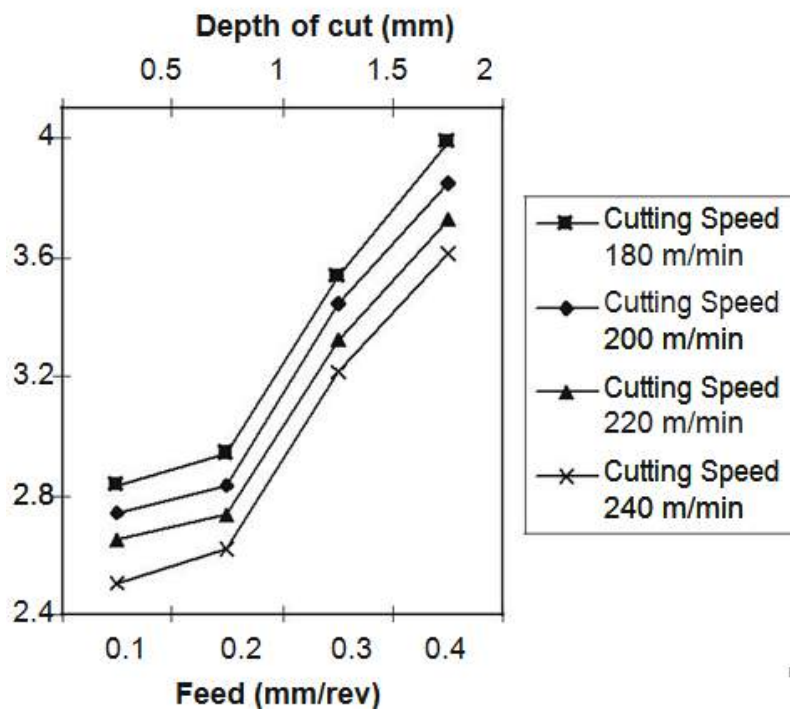Fig. 6. Variation of surface roughness of Al alloy using carbide insert
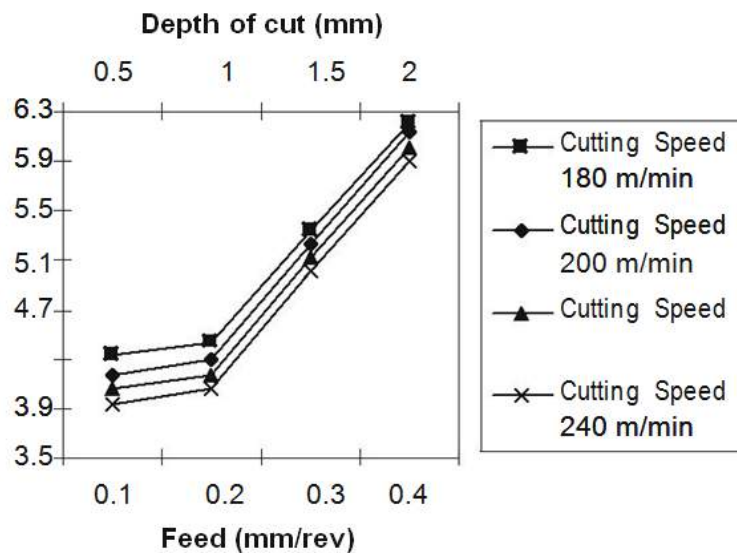
Fig. 7. Variation of surface roughness WC and E-Glass composite using carbide insert

Figures 8and 9show surface roughness during turning of Al alloy and WC and E-Glass composite, respectively, by using PCD inserts at feed of 0.1, 0.2, 0.3, and 0.4 mm/rev. Surface roughness of Al alloy increases sharply with the increase of feed from 0.2 to 0.4 mm/rev at all cutting speeds. Changes in feed rate from 0.1 to 0.4 mm/rev and DOC from 0.5 to 2.0 mm at cutting speed of 240 m/min caused increase in surface roughness of Al alloy by 38.13%. Surface rough-ness of composite increases sharply with the increase of feed from 0.2 to 0.4 mm/rev and DOC from 1 to 2.0 mm at all cutting speeds. Surface roughness of composite increases by 44.03% with the increase of feed from 0.1 to 0.4 mm/rev and DOC from 0.5 to 2.0 mm at cutting speed of 240 m/min.

Fig. 8. Variation of surface roughness of Al alloy using PCD insert

Fig. 9. Variation of surface roughness of WC and E-Glass composite using PCD insert

As can be seen from above figures, the surface roughness produced by carbide insert is more as compared to PCD insert, while machining Al alloy and WC and E-Glass composite at all feed rates and DOCs selected in the experiment. Fracture of the carbide insert cutting edges was higher than PCD cutting edges. This is due to the fact that hardness of diamond is more than the silicon carbide. It was considered that the fracture of the cutting edges of carbide insert caused these significantly high Ra values. Surface rough-ness (Ra) values measured on machined surfaces of WC and E-Glass composite were much higher than the Al alloy during the machining as the removals of WC and E-Glass particles cause some small gaps in machined surface. It is estimated that this condition caused an increase in surface roughness of WC and E-Glass composites as compared to Al alloy. The cutting speed plays an important role in deciding the surface roughness. At high cutting speeds, the surface roughness decreases. At low cutting speeds, the built up edge (BUE) is formed and also the chip fracture readily producing the rough surface. As the cutting speed increases, the BUE vanishes, chip fracture decreases, and hence the roughness decreases. The surface roughness increased with using higher feed rates in all machining conditions. This was attributed to high temperature in the cutting zone. Higher feed values increase temperature and this cause to decrease bonding effect between WC and E-Glass particles and Al alloy matrix.

The PCD inserts performed a lot better than the carbide inserts and were able to remove a greater amount of material. PCD inserts maintained a good surface finish on the workpiece throughout the experiment. No major degradation of workpiece surface quality was observed even at the end of the tests.
Surface roughness of WC and E-Glass composite during machining by the carbide insert is less in the feed range of 0.1 to 0.3 mm/rev and DOC range of 0.5 to 1.5 mm. These values of feed and DOC are recommended for machining by carbide tool in the cutting speed range of 180 to 220 m/min. Surface roughness of WC and E-glass composite during machining by PCD insert is more below cutting speed of 220 m/min. Machining by

PCD insert is recommended at cutting speed more than 220 m/min but at feed rate of less than 0.2 mm/rev and DOC less than 1.0 mm.

Tool Wear:

Flank wear is the measure most often used to assess tool condition. It occurs on the flank or relief face of the tool below the cutting edge. Flank wear is caused due to the abrasive action of the reinforced particles present in the metal matrix composite. A tool can be considered to have reached the end of its useful life when flank wear reaches a specified dimension. The extent of flank wear (V_B) can be measured as the distance between the top of the cutting edge and the bottom of the area where flank wear occurs

Carbide turning tools are usually replaced when the width of the flank wear area reaches some pre-defined limit. The 1993 international standard (ISO 3685) stipulates that a flank wear width of 0.76 mm width for rough turning and 0.38 mm for finish turning (Fig. 10) [7].
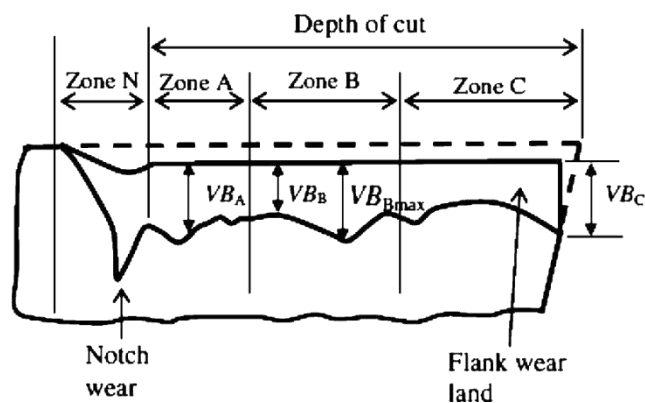
Fig. 10. Side view of cutting tool showing flank wear (ISO3685)

The worn out cutting inserts were examined under both optical and scanning electron microscope. ISO 3685 was followed for measurement of flank wear. Machining was continued for 7 min for carbide and PCD inserts for all the parameters considered. Each experiment was repeated three times and average value of readings was taken. Flank wear of carbide and PCD inserts while machining 7075 Al alloy with 4 wt.% WC and E-Glass composite is shown in Table 6. The carbide insert has 0.54 mm maximum flank wear (V_B) and PCD insert has 0.0102 mm maximum flank wear (V_B) when turning 27 mm diameter composite at a cutting speed of 240 m/min, a feed rate of 0.4 mm/rev, and a depth of cut 2 mm.Figures 11and 12indicate wear of carbide inserts during turning of 7075 Al alloy composite with change in cutting speeds and feeds, respectively.

Flank wear increases gradually with the increase of cutting speed, feed rate, and depth of cut. Flank wear increased by a factor of 2.4 with the increase of cutting speed from 180 to 240 m/min at feed of 0.1 mm/rev and DOC 0.5 mm. Increases in the flank wear is more at feed rate of 0.4 mm/rev and depth of cut of 2.0 mm as compared to other values of feeds and DOCs. Flank wear increased by a factor of 2.5 with the increase of feed from 0.1 to 0.4 mm/rev at cutting speed of 240 m/min. As can be seen from figures, lowest tool flank wear values were recorded at cutting speed of 180 m/min and feed rate of 0.1 mm/rev. In order to examine the tool wear in detail, the worn cutting tools were investigated using metallurgical microscope. Workpiece material adhered to the cutting edges at 180 and 200 m/min cutting speed. In this speed, range adhesive wear

is the dominant wear mechanism. When the cutting speed was increased beyond 200 m/min, abrasion and adhesion were the mechanisms dominating the tool wear.

TABLE 5: FLANK WEAR OF CARBIDE INSERT AND PCD INSERTS

Feed (mm/rev)	Depth of cut (mm)	Cutting Speed (m/min)	Flank wear (mm) using carbide insert	Flank wear (mm) using PCD insert
0.1	0.5	180	0.08	0.0040
		200	0.11	0.0044
		220	0.14	0.0046
		240	0.19	0.0052
0.2	1.0	180	0.16	0.0056
		200	0.18	0.0058
		220	0.22	0.0062
		240	0.28	0.0068
0.3	1.5	180	0.23	0.0068
		200	0.26	0.0070
		220	0.31	0.0076
		240	0.38	0.0084
0.4	2.0	180	0.41	0.0086
		200	0.45	0.0090
		220	0.48	0.0094
		240	0.54	0.0102
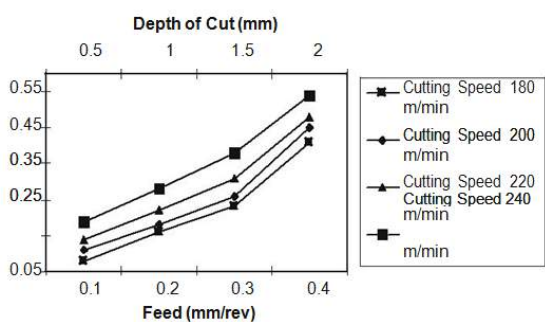
Fig. 12. Wear of carbide insert with feed
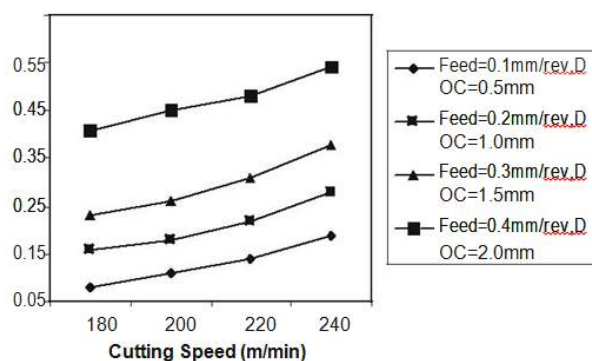
Fig. 11. Wear of carbide insert with cutting speed

PCD insert was monitored using a scanning electron microscope for normal types of tool wear namely crater wear, flank wear, and the nose wear as machining progressed. The wear on the PCD insert is caused by the abrasive nature of the hard particles

present in the work piece material. As diamond is harder than the WC and E-Glass, this abrasive wear may be associated with micromechanical damage rather than with micro-cutting [8].

Figures 13 and 14 indicate wear of PCD inserts during turning of WC and E-glass composite with respect to cutting speed and feed. Flank wear increases gradually with the increase of cutting speed, feed rate, and depth of cut. Flank wear increased by only a factor of 1.3 with the increase of cutting speed from 180 to 240 m/min at feed of 0.1 mm/rev and DOC 0.5 mm. At low cutting speeds, the worn flank encourages the adhesion of the work piece material and was therefore often covered with an aluminum film due to the high pressure generated. At same feed rate and depth of cut, the effect of cutting speed on flank wear was little. At same cutting speed, flank wear was higher when higher feeds and depth of cuts were used. Higher feed rates and depth of cuts at high cutting speed resulted in increased flank wear.

Flank wear increased by a factor of 1.96 with the increase of feed from 0.1 mm/rev to 0.4 mm/rev at the cutting speed of 240 m/min. In machining, Al-WC composites using PCD inserts, the predominant mode of tool wear is by abrasion [9].

Andrewes et al. [10] reported that when machining MMCs using PCD cutting tools, the initial flank wear starts with the abrasive effect of the hard particles and the workpiece material adheres to these abrasive grooves strongly due to the high pressure generated at the tertiary cutting zone as machining progresses. Each time a workpiece film adheres and breaks off as a result of the hard abrasive particles present in the workpiece, small diamond particles are also removed from the PCD cutting tool surface. This cyclic process leads to progressive loss of the PCD tool material. Wear of PCD inserts is less as compared to carbide inserts at all ranges of cutting speed, feed rate, and depth of cut studied. Since diamond has an

extremely low coefficient of friction and high thermal conductivity, crater wear is not a significant wear mode of tool failure in PCD inserts. Figure 15 indicates carbide insert before machining. Figure 16 represents carbide insert after machining for 7 min at cutting speed of 180 m/min, feed rate of 0.4 mm/rev, and DOC 2 mm.

The optical inspection of the flank face of the cutting inserts revealed the beginning of the flank wear. No substantial groove wear was observed; insert experience relatively wider, but shallower nose deformation with mild erosion of material over the tool.
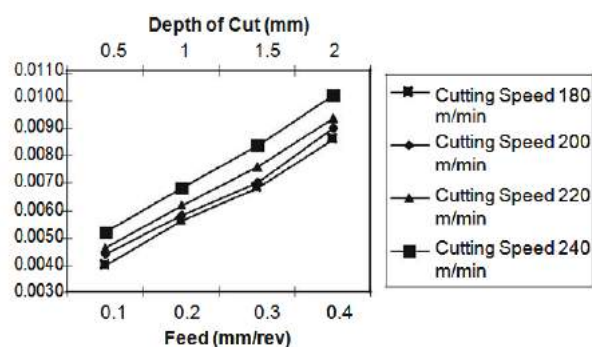

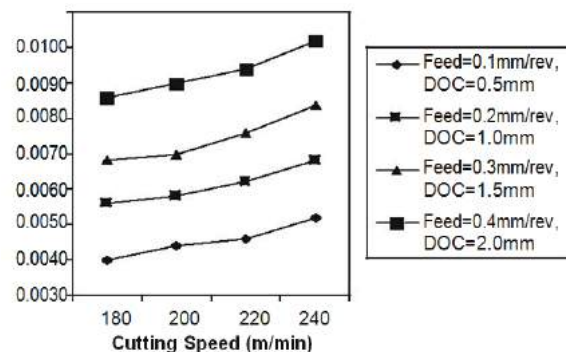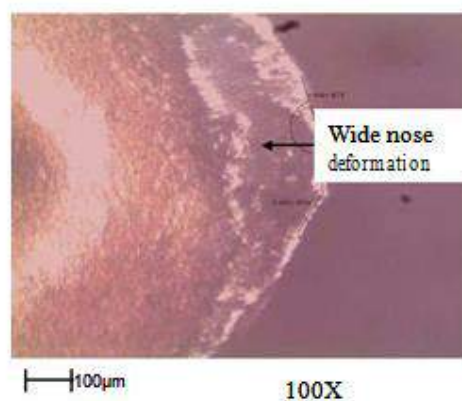Fig.14. Wear of PCD insert with feed
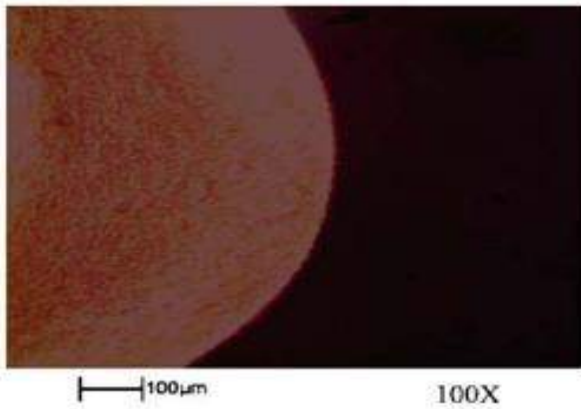

Fig. 13. Wear of PCD insert with cutting speed

Fig. 16 Carbide insert after machining atFig. 15. Carbide insert before machining cutting speed of 180 m/min

Figure 17shows carbide insert after machining at cutting speed of 240 m/min, feed rate of 0.4 mm/rev, and DOC 2 mm. It is seen that cutting insert experiences wide, deeper nose deformation with localized chipping over the cutting edge. Under the combined action of cutting force and temperature acting over the cutting edge, the tool experienced deformation of nose and consequent chipping.
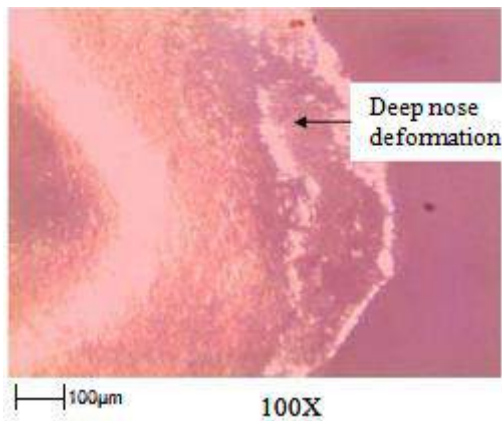

Fig. 17 Carbide insert after machining at cutting speed of 240 m/min

Figure 18shows scanning electron microscope micro-graph of PCD insert. The main wear pattern observed is flank wear. Flank wear is associated with abrasion wear tracks. Figures 19and 20shows the microstructure of WC composite after machining by carbide and PCD insert, respectively. It appears from these figures that WC particles are properly bonded with aluminum matrix at most of the places. The white particles indicate the transformation of

aluminum powder during machining of composite. Dark spots in Fig. 19show that machining of composite by the carbide insert is non-uniform. Less number of dark spots in Fig. 20is an indication of uniform machining by PCD insert as compared to machining by carbide insert. The WC particle has high yield strength and its elastic modulus is very high, whereas the 7075 Al alloy has low yield strength and good plasticity. Under force, the stress of the matrix is unequal to that of reinforcing particles. Thus, in the cutting process of WC and E-Glass composites, when the Al alloy matrix deforms plastically, the WC and E-Glass particles may only deform elastically to break. In addition to this, the boundary of the Al alloy matrix and the WC and E-Glass particles may break between the tool and reinforcing particles, which causes severe abrasive wear on the tool flank of carbide insert. This is the reason of non-uniform machining of WC and E-Glass composites by carbide insert.
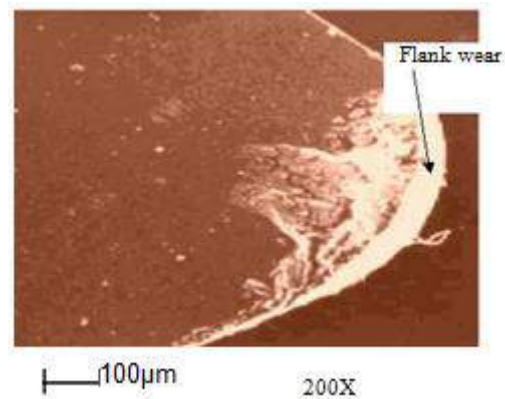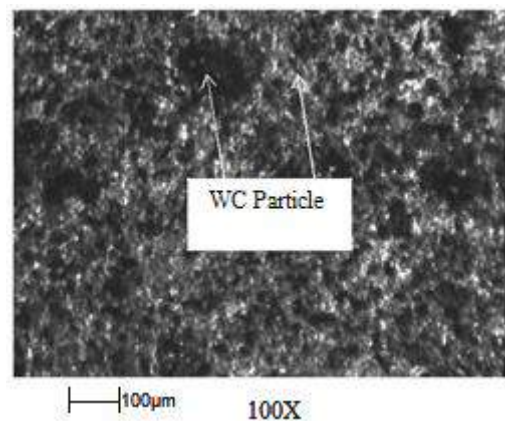

Fig. 18. SEM micrograph of PCD insert

Fig. 19. Microstructure of WC and E-glass composite after machining by carbide insert.
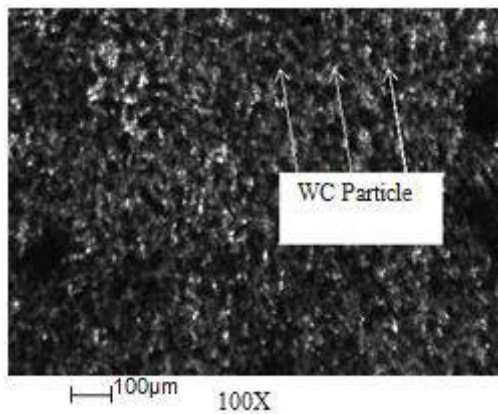

Fig. 20 Microstructure of WC and E-glass composite after machining by PCD insert

IV. Conclusion

In this work, effects of tungsten carbide and E-glass reinforcement to 7075 Al alloy on surface roughness and tool wear during turning have been investigated in terms of selected parameters such as cutting speeds, feed rates, and depth of cuts. The following conclusions are drawn based on the above experimental work:

1. Surface roughness of Al alloy is less as compared to Al alloy composite during turning by carbide as well as PCD inserts.
2. Wear of carbide and PCD inserts is less during turning of Al alloy as compared to Al alloy composite.
3. Wear of PCD insert is less as compared to wear of carbide insert during turning of Al alloy composite.
4. For optimum surface roughness in the workpiece, it is recommended that turning operation on Al alloy composite by carbide insert should be carried out at, cutting speed within the range of 180 to 220 m/min, feed rate within range of 0.1 to 0.3 mm/rev, and DOC within range of 0.5 to 1.5 mm. For minimum flank wear in the carbide insert, machining should be carried out at cutting speed of less than 200 m/min, feed rate of 0.1 mm/rev, and DOC 0.5 mm.

5. Based on the results of surface roughness in the work piece and flank wear in the tool, it is recommended that turning operation on Al alloy composite by PCD insert should be carried out at cutting speed higher than 220 m/min but at a feed rate of less than 0.2 mm/rev and DOC less than 1.0 mm.

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Behavior of Geo-polymer Concrete at Elevated Curing Temperature

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ABSTRACT

Production of Portland cement is resulting in two major environmental issues that are needed to be considered before it's too late to find out the solution. Firstly, manufacturing of PC is emitting 5% of the global CO_2 into the atmosphere causing global warming. Secondly, manufacture of PC requires limestone and clay that are depleting day by day. To produce 1 ton of PC, 1.6 tons of raw materials are needed to be extracted from the earth. To overcome the above problem a new concrete called Geopolymer is used. Geopolymer is an amorphous alumino-silicate product that exhibits the ideal hardening properties of elements. In the present study the strength development of geo polymer concrete is determined by varying temperature. To prepare geopolymer concrete the material used is Ground Granulated Blast Furnace Slag, sodium hydroxide activator and hydrated sodium silicate binder. The sodium hydroxide is varied in two molarities, 8 and 10 respectively. The sodium silicate had 30% water content in it. The curing was done in the oven with varying temperatures of 60, 80 and 100 degrees. The compressive strength test, split tensile test and flexural strength test showed higher strength at 8 molars and curing temperature being 100 degrees.

Keywords : Geopolymer concrete, NaOH, Hydrated sodium silicate.

I. INTRODUCTION

Geopolymer is a type of amorphous alumino-silicate product that exhibits the ideal properties of rock-forming elements, i.e. hardness, chemical stability and longevity. Geopolymer are used in aggregates to produce geopolymer concretes (GPC) which are ideal for structures and repairing work, since they have very high early strength. The properties of geopolymer include high early strength, low shrinkage, temperature resistance, sulphate resistance. These high-alkali binders do not generate any alkali-aggregate reaction. The geopolymer binder has low CO_2 cementations content. It does not relay on the calcinations of limestone that

generates CO_2. This technology can save up to 80% of CO_2 emission caused by the cement and aggregate industries. Geopolymer binders can be produced from waste materials containing Silicon (Si) and Aluminium (Al) ions. These waste materials can be Fly Ash, ground granulated blast furnace slag, met kaolin or any other waste sources of Si and Al. The other chemicals need to be added are sodium hydroxide, sodium silicate and water. Since geopolymers do not hydrate, they show characteristics of low shrinkage and excellent heat resistance. In 1978, Davidovits introduced the word 'GEOPOLYMER' to explain an innovative cementations material which has ceramic-like properties. With comparing to OPC, the

manufacturer of fly ash-ground granulated blast furnace slag (GGBS) based geo-polymer does not absorbed high levels of energy, as fly ash and slag is already an industrial by-product. This geo-polymer technology has the potential to reduce emissions by 80%. These also exhibit ceramic-like properties with superior resistance to fire at elevated temperatures. Fly ash, is available in huge quantity worldwide due to coal burning operations, is an excellent alumino-silicate material, whereas granulated blast furnace slag is a by-product produced from steel plants. In India, fly ash is currently under- utilized according to data available in the year 2000, 90 million tons per annum were produced but only 20-25% of it was effectively utilized in cementations application. Normally for ore feed containing 60 to 65% iron, slag production varies from about 300 to 540 kg per ton of pig or crude iron produced. Lower grade ores yield much higher slag fractions, sometimes as high as one tone of slag per ton of pig iron produced. Steel slag produces about 20% by mass of the crude steel outcome.

Lately, much research as highlighted the use of fly ash-based geo-polymer in concrete manufacturing. Geo-polymers also shown to have good bond strength to cement concrete; hence it is a good repair material for use in filling work and construction work. Fly ash and slag based geo-polymer/aggregate composites have high performance compared to cement concrete in certain areas such as resistance to sulfate attacks and have lower longer loading failure and expansion and contraction than conventional concrete. Geo-polymers are generally performed better than the conventional concretes in fire, due to their ceramic - like properties. In the present study the mix design of Geo-Polymer Concrete and the effect of varying proportion of activator and temperature on the concrete with respect to strength development of Ground Granulated Blast- furnace Slag based on Geo-Polymer Concrete are carried out. In the present study geopolymer concrete were prepared by varying molarity and temperature and optimum mix are prepared.

II. LITERATURE REVIEW

The main aim of the research was to find the desired mix. Based on the following literature we take up further study. R Prasanna Venkatesh, et al [1] carried-out study on Strength and durability properties of geopolymer concrete made with Ground Granulated Blast Furnace Slag and Black Rice Husk Ash. The Geopolymer concrete was prepared with GGBS as the primary binder instead of cement and BRHA was replaced with GGBS at various proportions such as 10%, 20% and 30%. Addition of BRHA in Geopolymer concrete beyond 10% reduce the strength development be the strengths are well above the target for up to 20% replacement. Sama T Aly et al [2] carry out study on Properties of Ceramic Waste Powder-Based Geopolymer Concrete. CWP's to produce geopolymer concrete is studied, and its strength and durability properties were tested. The 7 and 28 days 'curing results of the compressive strength, pores percentage, initial rate of water absorption, and bulk electrical resistivity showed the possibility of producing CWP- based geopolymer concrete. Vishalakshi Talakokula et al [3] conducted a study on Effect of Delay Time and Duration of Steam Curing on Compressive Strength and Microstructure of Geopolymer Concrete. From the Paper the results of an effect of delay time and duration of steam curing on the compressive strength and microstructure development of FA based geopolymer concrete specimens prepared by thermal activation of FA with sodium hydroxide and sodium silicate solution. Activating the FA with NaOH and NaSiO3 solution slightly increased the compressive strength of the GPC, but greatly decreased the microstructure of the GPC. Hayan Du et al [4] carried out a study on, Effects of characteristics of fly ash on the properties of geopolymer. The properties of class F fly ashes produced were investigated in the present study. The source material used in the geopolymer concrete was activated with sodium hydroxide and sodium silicate solution. The results revealed that the geopolymer produced with wet bottom boiler fly ash (CZ-FA) hardened quickly and had higher early-age strength

and lower shrinkage than the geopolymer produced with dry bottom boiler fly ash (SX- FA). The compressive strength of the two geopolymers made from CZ-FA and SX-FA was 45 MPa and 15 MPa respectively when cured at 60 °C and delayed for 14 d. C Banupriya et al [5] carried out a study on Experimental Investigations on Geopolymer Concrete using GGBS. A high volume GGBS based geopolymer concrete (mix proportion of 65, 70, 75 and 80% FA) used for bricks and high-volume ground granulated blast furnace slag based geopolymer concrete (mix proportion of 65, 70, 75 and 80% GGBS) used for paver blocks gave a rise in strength of concrete in ambient curing conditions.

III. MATERIALS AND METHODS

A. Physical characteristics of the Materials

The preparation of geopolymer concrete consisting of Ground granulated blast furnace slag (GGBS) and alkaline liquid. The physical properties of the above materials are given in Table.1 and Table.2 The fine aggregate and the coarse aggregate is procured from the local vendor and the properties of the aggregates are given in Table.3 and Table.4 respectively. Normal tap water was used to make the NaOH solution of 8 and 10 Molarity. All the materials are tested as per Indian standards.

TABLE I. PHYSICAL & CHEMICAL PROPERTIES OF THE GGBS

Sl no	Properties	IS Code	Limits	Result
1	Specific Gravity	IS 2720 part 3-1980	2.7 – 2.8	2.65
2	Bulk Density (kg/cm^3)	IS 2386 part 3 - 1963	1668	1400

Table II. CHEMICAL PROPERTIES OF GGBS

Sl no	Chemical Component	Result
1	SiO_2	33.43%
2	AL_2O_3	18.16%
3	CaO	37.37%

TABLE III. PHYSICAL PROPERTIES OF FINE AGGREGATE

Sl no	Properties	Limits	Results
1	Specific gravity	2.65	2.64
2	Zone	-	Zone II
3	Fineness modulus	2-4	2.5

TABLE IV. PHYSICAL Properties OF COURSE aggregate

Sl no	Properties	Limits	Results
1	Specific gravity	2.5 – 3	2.55
2	Water absorption	1 – 2 %	2%
3	Bulk density (gm/cc)	-	1.55

B. Mix Proportion

Geopolymer Concrete mixture design process is new and generally based on performance. The mix proportion for the geopolymer mix are tabulated below in Tabular V

TABLE V. QUANTITY OF MATERIALS

Sl no	Material	Quantity
1	Sodium Hydroxide	80Kg
2	Sodium Silicate	200Kg
3	GGBS	425Kg
4	Coarse Aggregate	946.6Kg
5	Fine Aggregate	745.6Kg
6	Water	120Lts

IV.   RESULT AND DISCUSSION
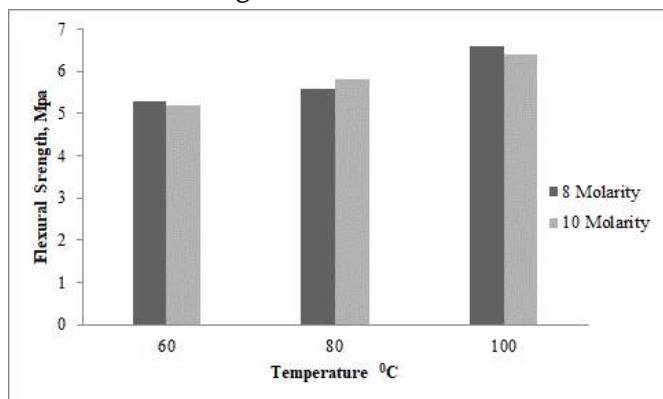
A. Compressive strength

The one-day cube compressive strength of oven – dry geopolymer cubes at varying temperature are showed in the Fig. 1. It is evident from the above table of comparison of compressive strength of the geo- polymer concrete, the strength of the concrete is maximum at 8 molarity of the sodium hydroxide solution, cured at the elevated temperature of 100℃ when compared to the ambient temperature (60℃) strength, or even the 10 molarity of sodium hydroxide solution cure at 100℃. When compared to the strength of 10 molar cured at 100℃, 8 molar mix is 7.5% more strength.
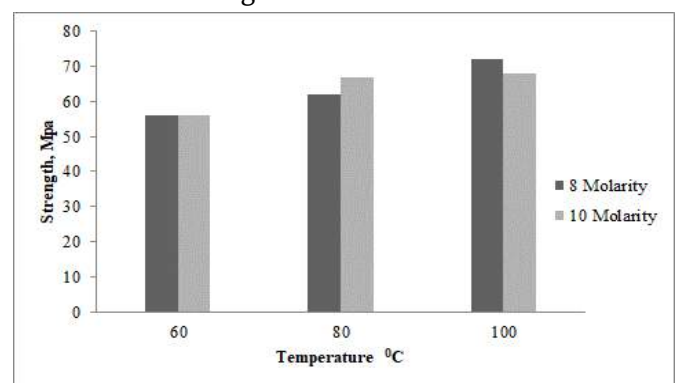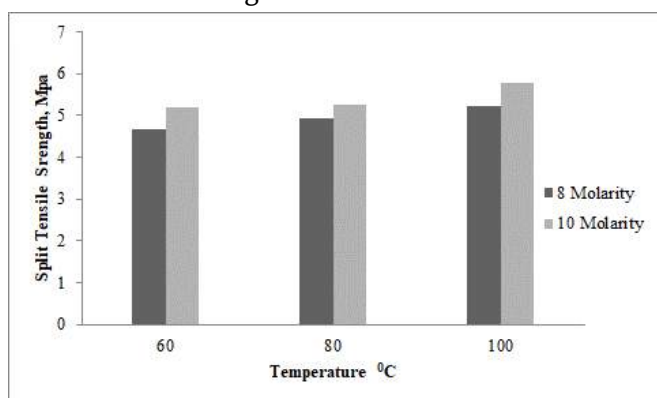

B. Flexural strength

The one-day flexural strength of oven – dry geopolymer beam at varying temperature is showed in the Fig.2. It is evident from the above table of comparison of flexural strength of the geo-polymer concrete, the flexural strength of the concrete is maximum at 8 molarity of the sodium hydroxide solution, cured at elevated temperature of 100℃

when compared to the ambient temperature (60℃) strength, or even the 10 molarity of sodium hydroxide solution cure at 100℃. When compared to the strength of 10 molar cured at 100℃, 8 molar mix is 4.8% more strength.

C. Split Tensile strength test

The one-day Split tensile strength test of oven – dry geopolymer cylinder at varying temperature is showed in the Fig.3. It is evident from the above table of comparison of split tensile strength of the geo- polymer concrete, the strength of the concrete is maximum at 10 molarity of the sodium hydroxide solution, cured at the elevated temperature of 100℃ when compared to the ambient temperature (60℃) strength, or even the 8 molarity of sodium hydroxide solution cure at 100℃. When compared to the strength of 10 molar cured at 100C, the 8 molar mix is 12.43% less strength.

V. CONCLUSION

The elevated temperatures certainly raised the compression, flexural and split tensile strength of the geo-polymer concrete by an average 0.625%, 0.275% and 0.212% respectively per degree Celsius. The main aim of our experiment being the study on strength development of the geo-polymer concrete can be positively concluded saying that increasing the temperature from ambient curing temperature (60℃) to elevated temperatures, such as, 80℃ and 100℃ leads to elevate the strength of the concrete. Evident from the results a 8 molar mix gives higher strength compared to 10 molar mix. The compressive strength increased by 12.5% when cured at 80° and by 28.6% when cured at 100° compared to 60° curing. The flexural strength increased by 5.5% when cured at 80° and by 22.2% when cured at 100° compared to 60° curing. The split tensile strength increased by 4.24% when cured at 80° and by 9.13% when cured at 100° compared to 60° curing. The GPC becomes slightly brittle with the increase in the temperature.

VI. REFERENCES

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