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Use of Internet of Things (IoT) in Womens Safety in Society

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ABSTRACT

The aim of developing this project is to employ health-based sensors in a real-time application to monitor a person's heartbeat, temperature and other aspects. Not only to monitor the levels but also to alert if there is any abnormality.

Keywords : Health-Based Sensors, Heartbeat, Temperature

I. INTRODUCTION

Women in India-a better half of Indian society. We come across many headlines reporting cases of sexual assault, molestation, sexual harassment, rapes, trafficking, ill treatment of women in houses, violence against women in remote areas etc. As responsible and good citizens, we have a most fundamental duty to contribute towards bringing an order to make sure that respect and dignity for women so that she can also enjoy her human fundamental rights and rights with sense of pride, freedom and confidence.

News stories of women from all over India being beaten, killed are discover across us day after day and we all are aware of it. Because of crime women safety has become doubtful topic. Although the lack of effective police services, lack of properly working helpline number are available, many of already developed apps and devices via smart phones for women security currently available beside these crimes happens. So, our contribution to this is we provide a security by using android applications .Attacks on women are at an all-time high and even highly safe cities aren't safe anymore. At any such unfortunate time, your smart phone can be your best friend and protector. Loaded with security apps for women, your smart phone can help you send emergency alerts to chosen people and also let people know about your whereabouts if anything goes wrong.

II. AIM AND SCOPE OF PRESENT INVESTIGATION

We provide you with some of the best applications that helps you send out a alert signal, book some safe cabs .Have them handy in your phone because security is not a longer an alternative, it is really needed. Secure system takes your GPS location and lists the nearest police stations surround you. It is extremely useful in emergencies such as theft or other such problems. Get information about Nearby Police station for your phone from here. The motto is "Never Walk Alone". Let's you create a net of 'Guardians' who will receive your message. The SOS message also includes your location through GPS. Most safety applications offer a distress message service. What makes Women Security different is that you can record a voice recording which is sent without your active interaction. The user can send continuous alerts to a chosen group of emergency contacts as well.

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III. EXPERIMENTAL OR MATERIAL AND METHOD

3.1 SYSTEM DESIGN

IoT stands for Internet of Things, which means accessing and controlling daily usable equipments and devices using Internet.

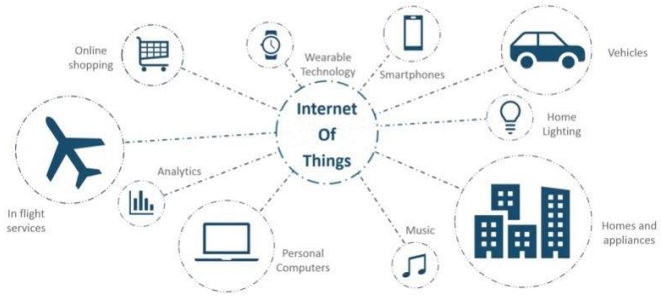

Figure 3.1 IoT applications

IoT is an advanced automation and analytics system which deals with artificial intelligence, sensor, networking, electronic, cloud messaging etc. to deliver complete systems for the product or services. The system created by IoT has greater transparency, control, and performance.

As we have a platform such as a cloud that contains all the data through which we connect all the things around us. For example, a house, where we can connect our home appliances such as air conditioner, light, etc. through each other and all these things are managed at the same platform. Since we have a platform, we can connect our car, track its fuel meter, speed level, and also track the location of the car.

If there is a common platform where all these things can connect to each other would be great because based on my preference, I can set the room temperature. For example, if I love the room temperature to to be set at 25 or 26-degree Celsius when I reach back home from my office, then according to my car location, my AC would start before 10 minutes I arrive at home. This can be done through the Internet of Things (IoT).

3.2 INTERNET OF THINGS:

The Internet of things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity

Which enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies" and for these purposes a "thing" is "an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks". The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of about 30 billion objects by 2020. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications.

The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and

expanding to areas such as smart cities. "Things", in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring, or field operation devices that assist firefighters in search and rescue operations. Legal scholars suggest regarding "Things" as an "inextricable mixture of hardware, software, data and service". These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include home automation (also known as smart home devices) such as the control and automation of lighting, heating (like smart thermostat), ventilation, air conditioning (HVAC) systems, and appliances such as washer/dryers, robotic vacuums, air purifiers, ovens, or refrigerators/freezers that use Wi-Fi for remote monitoring. As well as the expansion of Internet-connected automation into a plethora of new application areas, IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quick aggregation of the data, and an increase in the need to index, store, and process such data more effectively. IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.

3.3 EXISTING SYSTEM

-> The only thought haunting every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security. This paper suggests a new perspective to use technology for women safety. “848 Indian Women Are Harassed, Raped, Killed Every Day!!” That’s a way beyond HUGE number! We propose an idea which changes the way everyone thinks about women safety.

-> A day when media broadcasts more of women’s achievements rather than harassment, it’s a feat achieved! Since we (humans) can’t respond aptly in critical situations, the need for a device which automatically senses and rescues the victim is the venture of our idea in this paper.

-> We propose to have a microcontroller device using IOT, which continuously communicates with Smart phone that has access to the internet. The application is programmed and loaded with all the required data which includes temperature, heart beat and also victim motion.

DISADVANTAGES OF EXISTING SYSTEM

-> Bulk circuit needed.

-> Cost wise high.

3.4 PROPOSED SYSTEM

In this project, we use multiple sensor for the safety purpose like vibration sensor, heartbeat sensor, temperature sensor and GPS

The GPS is used to identify location If any harassment happen means, the temperature and heart beat level of the women’s will automatically increase. If any change occur, apart from normal level means, the esp8266 module (Wi-Fi module) will send message to the nearby police station as well as relations. If any unwanted person going to harass the women’s means the vibration sensor will work and make the sound using buzzer.

ADVANTAGES OF PROPOSED SYSTEM

-> It will give freedom to women’s.

-> It will saves many women’s and child’s life

-> Accuracy is high

3.5 BLOCK DIAGRAM

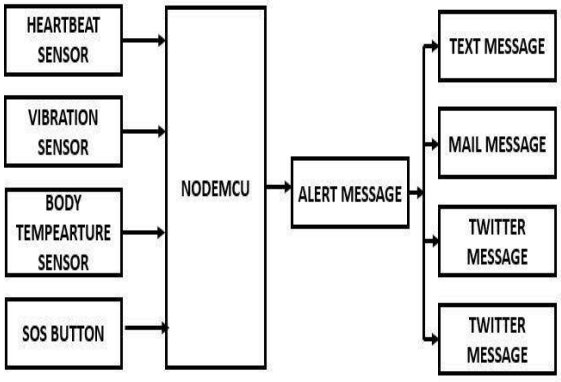

Figure 3.2 Block diagram of proposed system

HARDWARE DESCRIPTION

3.6 NODE MCU

NodeMCU is an open source IoT platform. Which includes firmware which runs on the ESP8266 Wi-Fi Module from Espressif Systems,and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. NodeMCU firmware was developed so that AT commands can be replaced with Lua scripting making the life of developers easier. So it would be redundant to use AT commands again in NodeMCU.
ESP8266

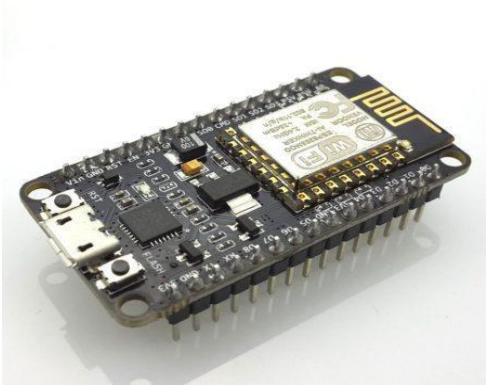

Figure 3.3 image of ESP8266 Node MCU

The ESP8266 is a small WiFi module built around the ESP8266 chip that can connect your microcontroller to the internet wirelessly for a very small cost. It can be a great option for Internet of Things (IoT) projects, but can be difficult to work with for beginner hobbyists who do not have prior experience with the module. In this tutorial, we hope to show you how to interface the ESP8266 with an Arduino and perform some basic functions like connecting it to a WiFi network. The ESP8266 is a low-cost Wi- Fi chip with full TCP/IP stack and microcontroller capability

ESP8266 Feature:
-> Open-source
-> Interactive
-> Programmable
-> Low cost
-> Simple
-> Smart

3.7 SOS BUTTON

Security system is a great way to protect your business, home or school from theft and vandalism when you're away. SOS buttons exist to protect people from personal harm. They can provide an instant alert to the monitoring company when the user feels they are in danger and need immediate emergency assistance. SOS is a globally accepted code signal for extreme distress situations. With a single click, the SOS button enables you to escalate matters of safety and related concerns to our safety response team in real time.

It must be noted that SOS is not an abbreviation and there it does not stand for anything. Although some phrases like "save our ship", "save our souls, and "send out succor" were popularly associated with SOS, these may be regarded as mnemonics.

3.8 HEARTBEAT SENSOR

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse.

Two Ways to Measure a Heartbeat

-> Manual Way: Heart beat can be checked manually by checking one's pulses at two locations- wrist (the radial pulse) and the neck (carotid pulse). The procedure is to place the two fingers (index and middle finger) on the wrist (or neck below the windpipe) and count the number of pulses for 30 seconds and then multiplying that number by 2 to get the heart beat rate. However pressure should be applied minimum and also fingers should be moved up and down till the pulse is felt.

-> Using a sensor: Heart Beat can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heart beat changes.

Principle of Heartbeat Sensor

The heartbeat sensor is based on the principle of photo plethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

There are two types of photo plethysmography:
Transmission: Light emitted from the light emitting device is transmitted through any vascular region of the body like earlobe and received by the detector.
Reflection: Light emitted from the light emitting device is reflected by the regions.

Working of a Heartbeat Sensor
The basic heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e.

light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate.
This signal is actually a DC signal relating to the tissues and the blood volume and the AC component synchronous with the heart beat and caused by pulsatile changes in arterial blood volume is superimposed on the DC signal. Thus the major requirement is to isolate that AC component as it is of prime importance.

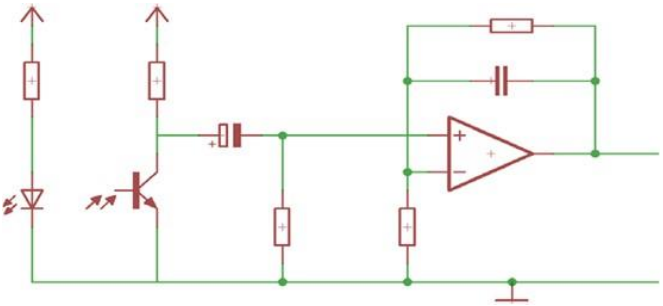

Figure 3.4 implementation circuit for heart beat sensor

To achieve the task of getting the AC signal, the output from the detector is first filtered using a 2 stage HP-LP circuit and is then converted to digital pulses using a comparator circuit or using simple ADC. The digital pulses are given to a microcontroller for calculating the heat beat rate, given by the formula-BPM (Beats per minute) = 60*f Where f is the pulse frequency Practical Heartbeat Sensor Practical heartbeat Sensor examples are Heart Rate Sensor (Product No PC-3147). It consists of an infrared led and an ldr embedded onto a clip like structure. The clip is attached to the organ (earlobe or the finger) with the detector part on the flesh.

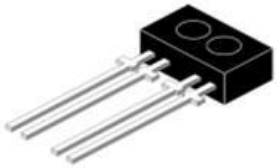

Figure 3.5 Image of Heart Beat Sensor Another example is TCRT1000, having 4 pins- Pin1: To give supply voltage to the LED
Pin2 and 3 are grounded. Pin 4 is the output. Pin 1 is also the enable pin and pulling it high turns the LED on and the sensor starts working. It is embedded on a wearable device which can be worn on the wrist and the output can be sent wirelessly (through Bluetooth) to the computer for processing.

Figure 3.6 Picture of TCRT1000 – smart heartbeat sensor

A basic Heartbeat Sensor system can also be built using basic components like a ldr, comparator IC LM358 and a Microcontroller as shown below. As described above regarding the principle of heart beat sensor, when the finger tissue or the earlobe tissue is illuminated using a light source, the light is transmitted after getting modulated i.e. a part getting absorbed by the blood and the rest being transmitted. This modulated light is received by the light detector.

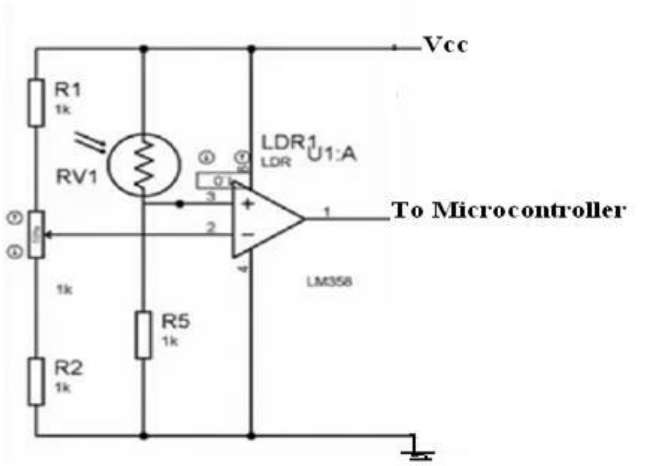

Figure 3.7 connection circuit for heartbeat sensor

Here a Light Dependent Resistor (LDR) is used as a light detector. It works on the principle that when light falls on the resistor, its resistance changes. As the light intensity increases, the resistance decreases. Thus the voltage drop across the resistor decreases.

Here a comparator is used which compares the output voltage from the LDR to that of the threshold voltage. The threshold voltage is the voltage drop across the LDR when the light with fixed intensity, from the light source falls directly on it. The inverting terminal of the comparator LM358 is connected to the potential divider arrangement which is set to the threshold voltage and the non-inverting terminal is connected to the LDR. When a human tissue is illuminated using the light source, the intensity of the light reduces. As this reduced light intensity falls on the LDR, the resistance increases and as a result the voltage drop increases. When the voltage drop across the LDR or the non-inverting input exceeds that of the inverting input, a logic high signal is developed at the output of the comparator and in case voltage drop being lesser a logic low output is developed. Thus the output is a series of pulses. These pulses can be fed to the Microcontroller which accordingly processes the information to get the heart beat rate and this is displayed on the Display interfaced to the Microcontroller.

3.9 BODY TEMPERATURE SENSOR

Temperature sensor is a thermocouple or a resistance temperature detector (RTD) that gathers the temperature from a specific source and alters the collected information into understandable type for an apparatus or an observer. Temperature sensors are used in several applications namely HV system and AC system environmental controls, medical devices, food processing units, chemical handling, controlling systems, automotive under the hood monitoring and etc.

LM35 Temperature Sensor

LM35 is used to measure the body temperature. Temperature varied due to food, atmosphere and stage of menstrual cycle. Minimum temperature range is 97.8 degrees Fahrenheit and maximum range is 99 degrees Fahrenheit. Temperature sensor measure the value and when the temperature reach above threshold value to give alarm.

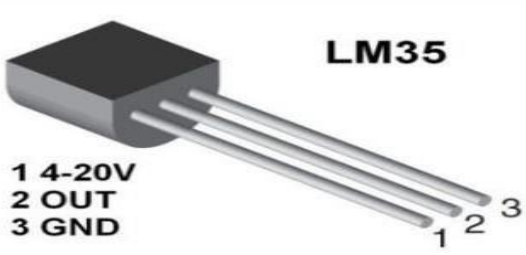

Figure 3.8 LM35 Temperature Sensor

The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical o/p comparative to the temperature (in °C). It can measure temperature more correctly compare with a thermistor. This sensor generates a high output voltage than thermocouples and may not need that the output

voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.

The LM35 does not need any exterior calibration and maintains an exactness of +/-0.4°C at room temperature and +/-0.8°C over a range of 0°C to +100°C.One more significant characteristic of this sensor is that it draws just 60 microamps from its supply and acquires a low self-heating capacity.

3.10 VIBRATION SENSORS

Vibration sensors are sensors for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration.

Abnormal vibration indicative of problems with an industrial machine can be detected early and repaired before the event of machine failure; because such a failure is potentially costly in terms of time, cost, and productivity, vibration measurement allows industrial plants to increase efficiency and save money. Therefore, vibration analysis is used as a tool to determine equipment condition as well as the specific location and type of problems.

The piezoelectric sensor is used for flex, touch, vibration and shock measurement. Its basic principal, at the risk of oversimplification, is as follows: whenever a structure moves, it experiences acceleration. A piezoelectric shock sensor, in turn, can generate a charge when physically accelerated. This combination of properties is then used to modify response or reduce noise and vibration.

Figure 3.9 Vibration Sensor

Features

-> The default state of the switch is close

-> Digital output Supply voltage:3.3V-5V

-> On-board indicator LED to show the results

-> On-board LM393 chip

-> SW-420 based sensor, normally closed type vibration sensor

-> Dimension of the board: 3.2cm x 1.4cm

This module features an adjustable potentiometer, a vibration sensor, and a LM393 comparator chip to give an adjustable digital output based on the amount of vibration. The potentiometer can be adjusted to both increase and decrease the sensitivity to the desired amount. The module outputs a logic level high (VCC) when it is triggered and a low (GND) when it isn't. Additionally there is an onboard LED that turns on when the module is triggered.

Many Applications can created by measuring Vibration level, but sensing vibration accurately is a difficult job. This article describes about vibration sensor SW-420 and Arduino interface then it may help you to design effort less vibration measurement. The vibration sensor SW-420 Comes with breakout board that includes comparator LM 393 and Adjustable on board potentiometer for sensitivity threshold selection, and signal indication LED.

Figure 3.10: Arduino interface circuit for vibration sensor

This sensor module produce logic states depends on vibration and external force applied on it. When there is no vibration this module gives logic LOW output. When it feels vibration then output of this module goes to logic HIGH. The working bias of this circuit is, between 3.3V to 5V DC.

This article discusses piezoelectric shock and vibration sensors and sensor technology, focusing on available products as well as design issues and design techniques.

HOW IT WORKS:

The piezoelectric effect was discovered by Pierre and Jacques Curie in the latter part of the 19th century. They discovered that minerals such as tourmaline and quartz could transform mechanical energy into an electrical output. The voltage induced from pressure (Greek: piezo) is proportional to that applied pressure, and piezoelectric devices can be used to detect single-pressure events as well as repetitive events.

Still, the ability of certain crystals to exhibit electrical charges under mechanical loading was of no practical use until very-high- input impedance amplifiers enabled engineers to amplify the signals produced by these crystals. Several materials can be used to make piezoelectric sensors, including tourmaline, gallium phosphate, salts, and quartz. Most electronic applications use quartz since its growth technology is far along, thanks to development of the reverse application of the piezoelectric effect; the quartz oscillator.

Sensors based on the piezoelectric effect can operate from transverse, longitudinal, or shear forces, and are insensitive to electric fields and electromagnetic radiation. The response is also very linear over wide temperature ranges, making it an ideal sensor for rugged environments. For example, gallium phosphate and tourmaline sensors can have a working temperature range of 1,000°C.

The physical design of the piezoelectric sensor depends on the type of sensor you wish to create. For example, the configuration of a pressure sensor, or a shock (impulse) sensor, would arrange a smaller, but well-known mass of the crystal in a transverse configuration, with the loading deformation along the longest tracks to a more massive base (Figure 1). This assures that the applied pressure will load the base from only one direction.

A constrained mass is allowed to deform the crystal sensor in one axis. This configuration is good for force and pressure.

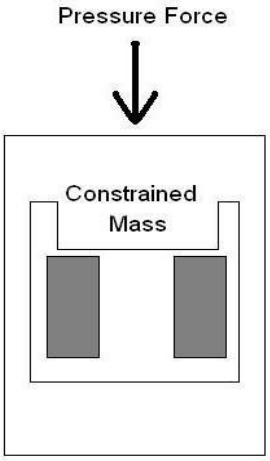

Figure 3.11 piezoelectric crystal with constrained mass

An accelerometer based on the piezoelectric effect, would use a known mass to deform the sensing crystal part in either a positive or negative direction depending on the excitation force. It should be noted that you need a known modulus of elasticity in the sensor substrate.

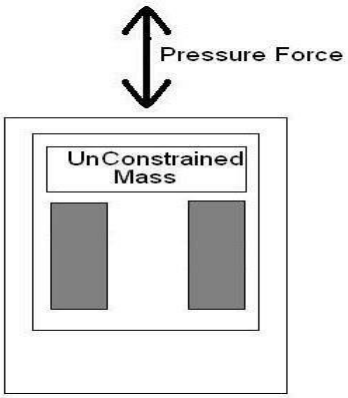

Figure 3.12 piezoelectric crystal with unconstrained mass

Because the modulus of elasticity is known for a substrate material, the unconstrained mass is allowed to move with vibration making this type of piezoelectric sensor ideal for detecting shock and vibration.

Designing with piezoelectric sensors piezoelectric sensors require some precautions when connecting to sensitive electronic components. First and foremost, the voltage levels created by hard shock can be very high, even around 100-V spikes.

More than likely, an op amp will be used to interface these sensors to an A/D converter, either discrete or on a microcontroller. One tip is to choose a high-input-impedance op amp to minimize current. One possible candidate is the Linear Technology JFET input dual op amp. It has 10^{12} Ω input resistance and a 1 MHz gain bandwidth product, good enough to easily handle the vibration ranges of piezoelectric sensors.

Another suitable part is the TLV2771 from Texas Instruments. This rail-to-rail low-power op-amp also has a 10^{12} Ω differential input resistance and a 5 MHz unity-gain bandwidth. Signal conditioning in a single stage can prepare the input from the shock sensor directly into an A/D converter.

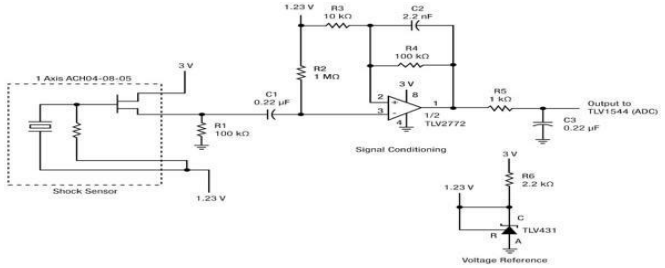

Figure 3.13 driver circuit for piezoelectric sensors

Op amps such as the TI TLV2772 feature high input impedances to help minimize current from the potentially high- voltage inputs from the piezoelectric sensors. Op-amp circuits can be designed to operate in voltage mode or charge mode. Charge mode is used when the amplifier is remote to the sensor. Voltage mode is used when the amplifier is very close to the sensor.

Another tip is to attenuate the input signal and use the op amp's gain to bring into the desired range. Be aware that you may need snubbing protection on the inputs of the op amp, especially if the design could be subjected to harsh hits. Also note that you may think that a pressure sensor would generate only a positive voltage, but, in reality, the signal from the sensor can ring and introduce negative voltage spikes , shown below. This means that you may need to squelch negative voltage

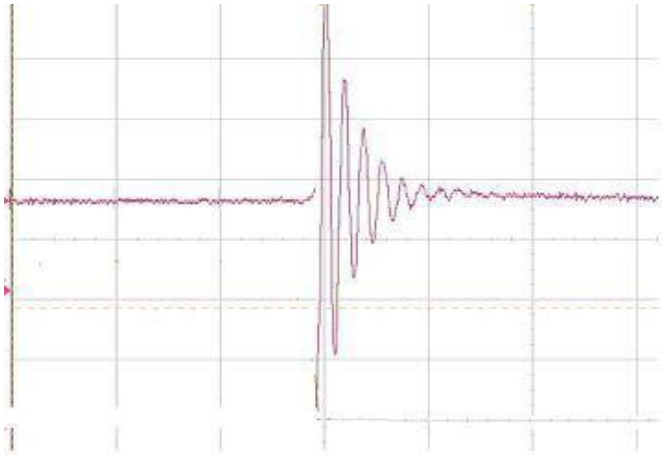

Figure 3.14 Output voltage waveform of piezoelectric crystal levels on the op-amp inputs, especially if using only a single rail power supply on the op amp.

Care must be taken when using single rail op amps since shock can cause negative voltage spike ringing that can damage op-amp inputs if not squelched.

Parts for the design

Many of the shelf piezoelectric sensors are readily available to use in your designs. A case in point is the Parallax 605-00004, which is a piezo vibrator sensor capable of acting as a switch, or as a vibration sensor (Figure 5). A polymer film laminate uses crimped contacts and features a sensitivity of 50 mV/g.

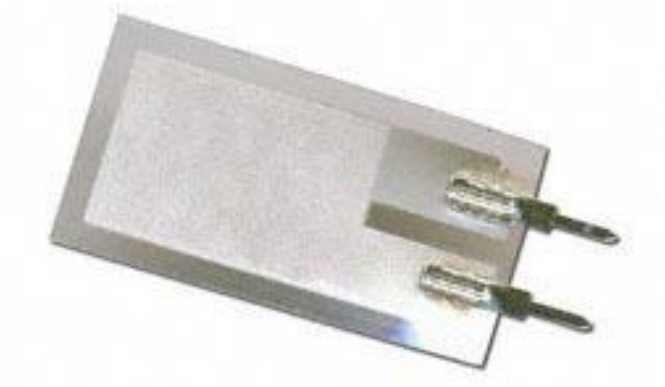

Figure 3.15 image of polymer film type piezoelectric sensor

The flexible through-hole LDTO polymer film piezoelectric sensors can be hard mounted or free floating to detect strain, shock, or vibration.

You should be aware that adding mass to a piezoelectric sensor can change its resonant frequency as well as change its baseline sensitivity. Many piezoelectric sensors like the 605-00004 are

characterized to be used this way and provide supporting tables and graphs.

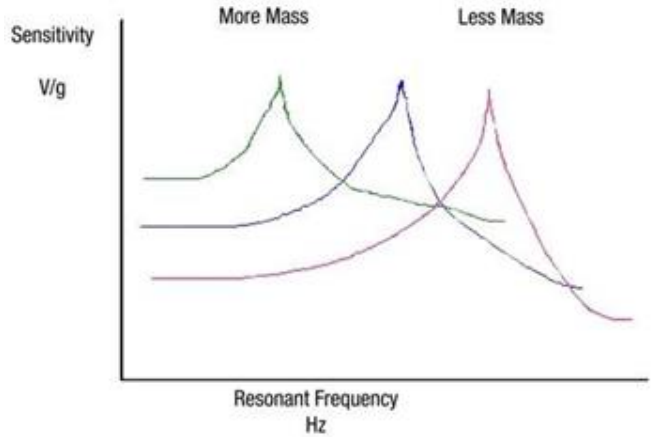

Figure 3.16 characteristics of piezoelectric crystal

3.11 SOFTWARE DESCRIPTION

ARDUINO IDE

Arduino IDE is a lightweight, cross-platform application that introduces programming to novices. It has both an online editor and an on-premise application, for users to have the option whether they want to save their sketches on the cloud or locally on their own computers.

While Arduino IDE is highly-rated by users according to ease of use, it is also capable of performing complex processes without taxing computing resources.

With Arduino IDE, users can easily access contributed libraries and receive up-to-date support for the latest Arduino boards, so they can create sketches that are backed by the newest version of the IDE.

Arduino IDE Benefits Multi-Platform Application

Arduino IDE works on the three most popular operating systems: Windows, Mac OS, and Linux. Aside from that, the application is also accessible from the cloud. These options provide programmers with the choice of creating and saving their sketches on the cloud or building their programs locally and upload it directly to the board.

Board Management

Arduino IDE comes with a board management module, where users can select the board they want to work with at the moment. If they wish to change it, they can do so easily from the dropdown menu. Modifying their selection also automatically updates the PORT infos with the data they need in relation to the new board.

Straightforward Sketching

With Arduino IDE, users can create programs called sketches that are built with a text editor. The process is a straightforward one though it has several bells and whistles that make the experience more interactive.

Project Documentation

Arduino IDE offers programmers the option to document their projects. This function allows them to keep track of their advancements and any changes they make every time. Apart from that, documentations allow other people to easily employ the sketches to their own boards.

Simple Sketch Sharing

Aside from saving and archiving sketches and uploading them to the board, Arduino IDE is also capable of sharing sketches (available only on the cloud version). Each sketch is given its own unique URL that users can share with their colleagues and fellow Arduino hobbyists. The recipient then has access to the code; they can save it in the cloud sketchbook or download it for their own use.

Vast Library

Arduino IDE has more than 700 libraries integrated. These were written and shared by members of the Arduino community that other users can utilize for their own projects without having to install anything. This enables programmers to add a different dimension to their sketches.

Third-Party Hardware Support

While Arduino IDE is designed specifically for Arduino boards, it also supports connections with

third-party hardware. This makes the use of the application more extensive rather than limited to proprietary boards.

IV. IV. SYSTEM ANALYSIS

4.1 INTERNET OF THINGS (IoT)

Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes. Some also use the term industrial Internet interchangeably with IoT. This refers primarily to commercial applications of IoT technology in the world of manufacturing.

BENEFITS OF IoT

• Improved Customer Engagement

IoT improves customer experience by automating the action. For e.g. any issue in the car will be automatically detected by the sensors. The driver, as well as the manufacturer, will be notified about it. Till the time driver reaches the service station, the manufacturer will make sure that the faulty part is available at the service station.

• Technical Optimization

IoT has helped a lot in improving technologies and making them better. The manufacturer can collect data from different car sensors and analyze them to improve their design and make them much more efficient.

• Reduced Waste

Our current insights are superficial, but IoT provides real-time information leading to effective decision making & management of resources. For example, if a manufacturer finds fault in multiple engines, he can track the manufacturing plant of those engines and can rectify the issue with manufacturing belt.

APPLICATIONS OF IoT

The versatility of IoT has become very popular in recent years. There are many advantages to having a device based on IoT. Mckinsey Global Institute reports that IoT business will reach 6.2 trillion in revenue by 2025. There are lots of applications are available in the market in different areas.

Personal Home Automation System:

Wemo Switch Smart Plug: It is the most useful devices which connected home devices in the Switch, a smart plug. It plugs into a regular outlet, accepts the power cable from any device, and can be used to turn it on and off on hit a button on your smartphone.

Enterprise:

In the enterprise area many applications are there Like environmental monitoring system, smart environment etc.

Nest Smart Thermostat: It is connected to the internet. The Nest learns automatically your family's routines and will automatically adjust the temperature based on your activities, to make your house more efficient. There is also a mobile app which allows the user to edit temperature and schedules.

Utilities:

Smart metering, smart grid, and water monitoring system are the most useful applications in the various utility area.

Energy Management:

Advanced Metering Infrastructure is the major example in this area.

Large scale deployment:

There are various large projects ongoing in the world. Songdo (South Korea), the first of its kind fully wired Smart City, is near completion. Everything in this city is planned to be wired, connected and turned into a data stream that would be monitored by an array of computers without any human interaction.

Transportation:

Electronic toll collection system is the most useful example in this area.

Medical and Health Care:

Remote health monitoring and emergency notification system are examples of IOT in the medical field.

Health patch Health Monitor: It can be used for the patient who can't go to doctors, letting them get ECG,

heart rate, respiratory rate, skin temperature, body posture, fall detection, and activity readings remotely.

4.2 SOFTWARE INTRODUCTION

4.2.1 Introduction To Embedded C

Looking around, we find ourselves to be surrounded by various types of embedded systems. Be it a digital camera or a mobile phone or a washing machine, all of them has some kind of processor functioning inside it. Associated with each processor is the embedded software. If hardware forms the body of an embedded system, embedded processor acts as the brain, and embedded software forms its soul. It is the embedded software which primarily governs the functioning of embedded systems.

During infancy years of microprocessor based systems, programs were developed using assemblers and fused into the EPROMs. There used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check correct execution of the program. Some 'very fortunate' developers had In-circuit Simulators (ICEs), but they were too costly and were not quite reliable as well.

As time progressed, use of microprocessor-specific assembly- only as the programming language reduced and embedded systems moved onto C as the embedded programming language of choice. C is the most widely used programming language for embedded processors/controllers. Initially C was developed by Kernighan and Ritchie to fit into the space of 8K. and to write (portable) operating systems. Originally it was implemented on UNIX operating systems.

As it was intended for operating systems development, it can manipulate memory addresses. Also, it allowed programmers to write very compact codes. This has given it the reputation as the language of choice for hackers too.

4.2.2 Embedded Systems Programming

Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, are as follows:

- Embedded devices have resource constraints(limited ROM, limited RAM, limited stack space, less processing power)
- Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components.
- Embedded systems are more tied to the hardware.

Two salient features of Embedded Programming are code speed and code size. Code speed is governed by the processing power, timing constraints, whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum features in minimum space and minimum time.

Embedded systems are programmed using different type of languages:

- Machine Code
- Low level language, i.e., assembly
- High level language like C, C++, Java, Ada, etc.
- Application level language like Visual Basic, scripts, Access, etc.

Assembly language maps mnemonic words with the binary machine codes that the processor uses to code the instructions. Assembly language seems to be an obvious choice for programming embedded devices. However, use of assembly language is restricted to developing efficient codes in terms of size and speed. Also, assembly codes lead to higher software development costs and code portability is not there.

Developing small codes are not much of a problem, but large programs/projects become increasingly difficult to manage in assembly language. Finding good assembly programmers has also become difficult nowadays. Hence high level languages are preferred for embedded systems programming.

4.2.3 Use of C in Embedded Systems:

- It is small and reasonably simpler to learn, understand, program and debug.

• C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
• Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.
• As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'
• It is fairly efficient
• It supports access to I/O and provides ease of management of large embedded projects.

Many of these advantages are offered by other languages also, but what sets C apart from others like Pascal, FORTRAN, etc. is the fact that it is a middle level language; it provides direct hardware control without sacrificing benefits of high level languages .Compared to other high level languages, C offers more flexibility because C is relatively small, structured language; it supports low-level bit-wise data manipulation. Compared to assembly language, C Code written is more reliable and scalable, more portable between different platforms (with some changes). It is easier to write good code in C & convert it to an efficient assembly code rather than writing an efficient code in assembly itself. Benefits of assembly language programming over C are negligible when we compare the ease with which C programs are developed by programmers.

4.2.4 Applications of Embedded Systems

Embedded systems have a vast variety of application domains that varies from low cost to high, consumer electronics to industrial equipments, entertainment devices to academic equipments and medical instruments to weapons and aerospace control systems. The applications of embedded systems include home appliances, office automation, security, telecommunication, instrumentation, entertainment, aerospace, banking and finance, automobiles personal and in different embedded systems projects.

4.3 SOFTWARE DESCRIPTION Arduino IDE:

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

1. Open Arduino IDE as shown below

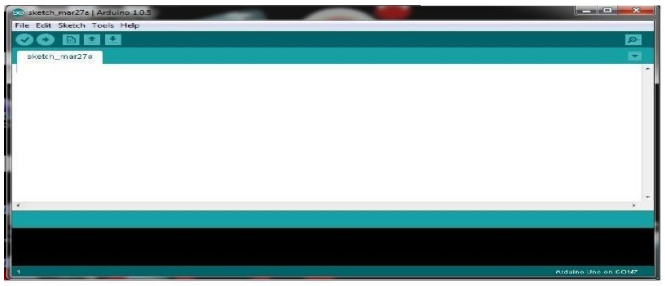

Fig 4.1 Opening Arduino IDE

2. Select the COM Port from tool

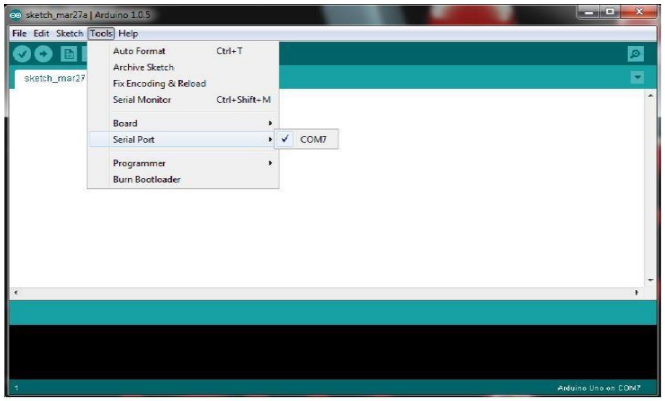

Fig 4.2 Selecting the COM Port

3. Select the required Arduino board from Tools as shown below

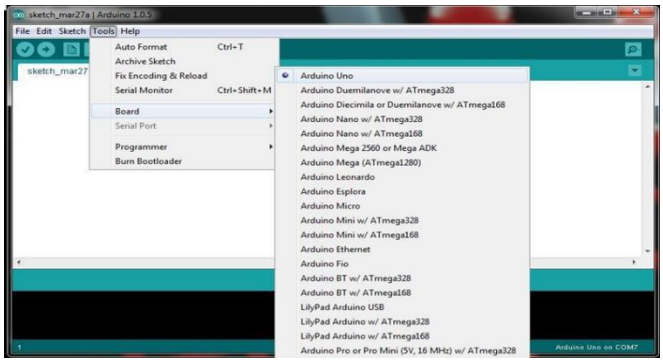

Fig 4.3 Selecting the required Arduino board

4. Write the sketch in Arduino IDE

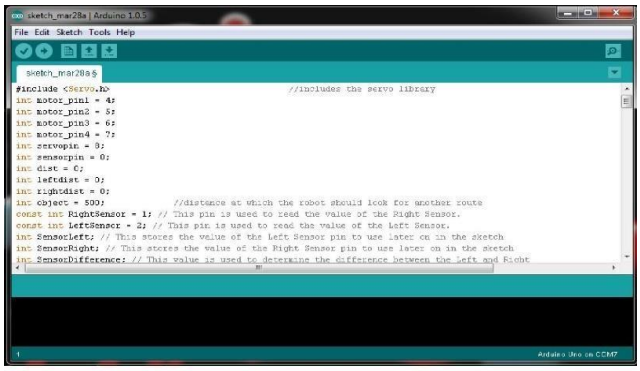

Fig 4.4 Sketching a program in Arduino IDE

5. Compile and upload the Sketch to Arduino board

Fig 4.5 uploading the program Sketch to Arduino board

V. CONCLUSION

This type of an idea being the first of its kind plays a crucial role towards ensuring Women Safety in the fastest way possible automatically. The proposed design will deal with critical issues faced by women in the recent past and will help solve them through technologically sound gadgets. With further research and innovation, this project can be implemented in different areas of security and surveillance. The system can perform the real time monitoring of desired area and detect the violence with a good accuracy. Today in the current global scenario, the prime question in every girl's mind, considering the ever rising increase of issues on women harassment in recent past is mostly about her safety and security. We propose a work which changes the way everyone thinks about women safety.

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