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Design and Implementation of Smart Security System for Farm Protection from Intruders

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ABSTRACT

Automation or IoT is the new technology which is used to making security of different type of firm planning all over the world. The device inaugurated of designing such kind of help for farm owner or farmers and as well as different type of farmhouse holder can get benefited with this device. Structure of device which has arduino based operational function that can make security of farming area from various type of intruders that may reach harm or destruction for farm related goods such as crops, paddy, barley etc, by their activities or nature. As clear words animal can destroy all crops by eating or doing incoherent activities. As same not only animal every kind of intruder can be detected by this device and can be able to notify owner of farms. It is an unconventional approach for giving security to farm for relieving destruction of crops. That will be less costly and as well as more production will be secured by using this device. The farm security method which is right now going that is more unplanned typical way adopted time consuming and as well as laborious. Actually it has been followed from earlier era to till right now as in analog way. This device operation is indication of digitalization, in analog way of security of firm by using arduino, GSM module and ultrasonic sensor etc. There is a fundamental need to develop such environmental friendly device which can give ensure of safety of farm that will be make advantage for farmers as well as farm owners. This device will able to give less physical effort and pollution free output of farm security. Design style device is more simple as with workable capability. the methodology of work of this device is where intruders is recorded by using camera attached with sensors that is capturing images of animals and other intruder and sends the notification to mobile.

Keywords: Arduino UNO, Design Analysis, Ultrasonic Sensor, GSM, Camera, Detection.

I. INTRODUCTION

A device of maintaining digitally denoted as system of security which is assure of less physical effort with most specified indicated output for a farm. Usually farmers have to face problem of intruders attacking in their farm for destroying crops. It is not possible to giving guard everytime for intruders as a barrier of such kind of activities. That time this device can make this work very easier and a affordable for farmers by detecting intruders and operational buzzer would able to make escape of that intruders and send notification to farmers or owner mobile as a notification massage of safety of the farm at that moment. Farm Security is smart way to protect the farm. This work describes the methodology where intruder is recorded by using camera attached with sensors that is capturing images of animals and other intruder and sends the notification to mobile. The phases involved are detection phase, in which animals are detected. Animal recognition and verification phase where faces detected are directly send to farmers mobile for further action. unconventional approaches have been developed recently, including safety system conversion, i.e., Conversion of manual safety system to autonomous safety system.

II. LIGATURE SURVEY

Abdesalam,Manak gupta ,Sajan(1) , make a proposal about farm security that a model of End to End communication formed cyber security system of farm. A roadmap of cyber security has been defined there that make the operation for whole process. Multilayer smart farming system has been created by them where main base of work principal is smart farming Eco system.

Rolen Kylon ,A. Mondeza rionel B. Keldo (2), proposed a model which interacted with image processing . In this model CCTV camera is used for detection of image. This project is based on basically smart farming security of farm area. That work principal is based on image processing system that can have been known as the main operational part of this model. It has been proposed on October 16 on the basis of area security of smart faming. Hence , balancing sensors are needed to accommodate the change in operational process of image processing.

Sudip Mittal, sajad khorsundroo (3) has give a proposal of smart farming that is based on cloud computing. As security system of farm has been based in operational activity of artificial intelligence. This model has been designed as the form of layer architecture that has been give more efficiency to operational process. Cyber physical system has been formed this model and as well as edge computing operational process also has been done.

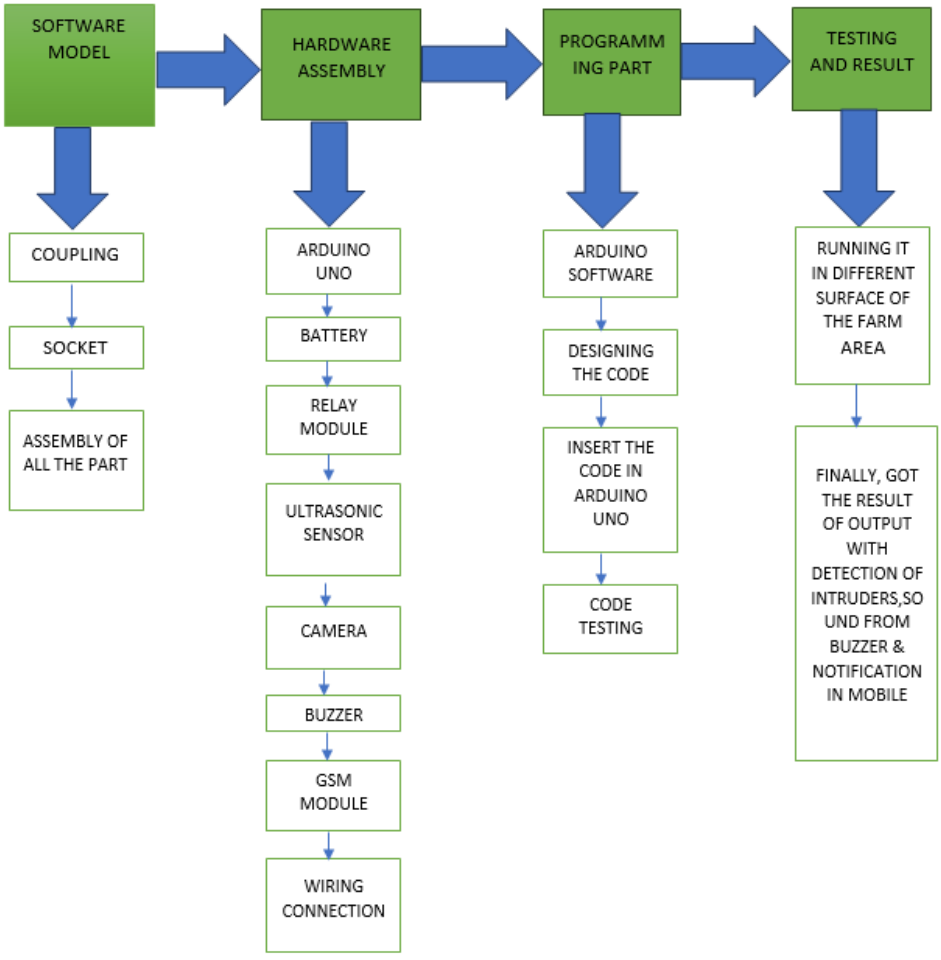
Vikram M Kakade, (4) developed localization algorithm-based model of farm security.In this model Rasberry pi , GSM Module and camera is used basically the secondary part of procet but innitaly has been main part of that initial working of this project is indication which s done by ultrasonic sensors. That working model has good efficiency as well as ecofriendly and cost of model or device less which is beneficiary for users.

Ido Wu Olubenga,Elizabeth Oluwakemi,, (5) proposed a ICT based localization farm of nano technology farm security system. Where it has working base of information communication technology based plan security system. Nano technology is the advanced technology of ra that is make this security system in ne dimention. It has also work processs of instruction in smart farm security system.

Dr. mouli M jahan, William k hatchison,Ouyang (6) build a theoretical proposal to give smart farming system as rapidly developing cyber risk in America food system, slow regulatory of smart devices is the main principal or main reason for establishing this model. Basically this model has been stand for development of cyber security challenge of farming in north America.

Based on this literature review, it can be concluded that safety system of farming has a great effectiveness for upcoming use. A comprehensive research has been performed to select different material, method and designing of different safety system that offer features such as productivity,eco friendly, economical produced base in a large scale and benefit for farmers. Conceptual task has been performed on the provision of safety system and theoretical expressions introduced, based on ideal assumptions. The proposed technique figured out new factors for design of an effective safety system. The four factors considered herein are the cutting speed of the blade, turf quality, battery life span and the design analysis. Knowledge with respect to the factors governing for safety system is beneficial for the society and accordingly, suitable modifications are introduced into the proposed model. Their effects on the farm and efficiency are plotted for the proposed system.

DESCRIPTION OF WORKING PROCESS



Figure(a): Block diagram of Farm Security System

Design Thinking is a methodology used by designers to solve complex problems ,desirable solutions for users. Design Thinking draws upon logic, imagination, intuition, and In this work, systemic reasoning, to explore possibilities of what could be, and to create desired that benefit the end user. A design mind-set is not problem-focused, its solution focused, and action oriented. It involves both analysis and imagination The body formation of device related with farm security operation incorporated with frame designing appropriation of components. After building the model of security device in software we have elected different hardware parts like connecting wires, camera, ultrasonic sensor, buzzer, Arduino Uno, wooden pieces, battery etc. The part which we elected for device, some of the parts we have purchased online and rest of them we bought from local shop. After collecting all of the parts ,initially we structured and make a architectural design for sattle down all the other parts orderly. Secondly, we have assembled them robustly with the glue for giving strength and clip in a manner that it cannot fall off. We have designed the device in a way that it can carry the load of camera, ultrasonic sensor, buzzer etc. Once the assembly is done, now we dealt with most significant part of the project which is programming. For programming we have used Arduino software and built the program according to our need. Then, we have tested system for different surface area and field whether it can detect the intruders accurately and simultaneously taking step that means detect, sending notification to owner through mobile and make ensure of safety of farm.

WORKING OPERATION OF FARM SECURITY SYSTEM

As per following consideration of working function the system is going to be work, here first whenever any intruders or animal try to cross the boundaries of farm sensor automatically detects it through certain range by using ultrasonic sensor. Once the intruders is identified its image has been taken with the help of Camera with sensor and image is going to be stored in store location. Parallel to capturing of image the buzzer has been initiated by controller which sends unwanted noise to animal due to which animal gets disturbed and they hold themselves from entering into farm or chase from farm.

Factors under consideration in the designing and analysis of farm security are given below:

- To form and maintained functional security system for farm protection..
- Prohibit the entry of animal into the farm by making noise for that animal that means make disturbance for that intruders.
- Using GSM module for getting notification for intruders through mobile phone.
- Design and adorned a operational system that sounds when animal tries to enter into the farm after detecting intruders.
- If in case any intruders try to entering in the farm message can be send to the owner of the farm.
- By detection of intruders via sensors that will work as operation of measuring distance using ultrasonic wave.

The aim of our project is to detect the wild animals using ultrasonic sensor and send an alert to the authorized person via GSM module. In above figure show the basic block diagram of the system as simple word intruders detection system. Our project system can be capture the image and which is used for identifying or comparing the images in the database. Power supply given by solar panel or from regulated power supply. Camera module

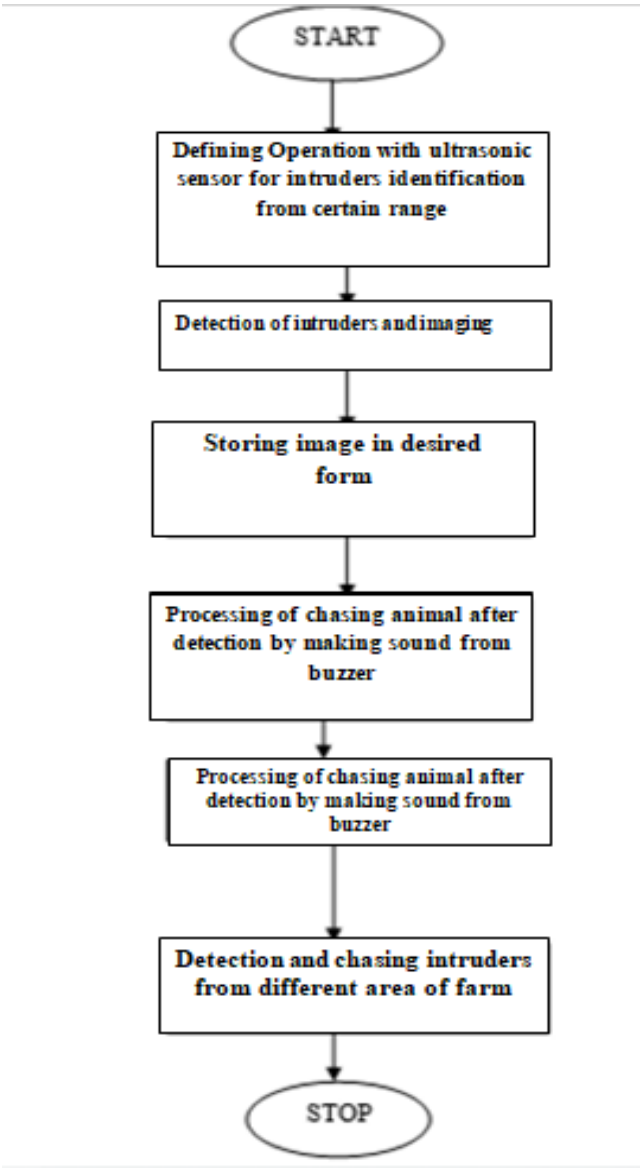
is interfacing towards operational function. It is used for captures an image and store it authorized memory location.

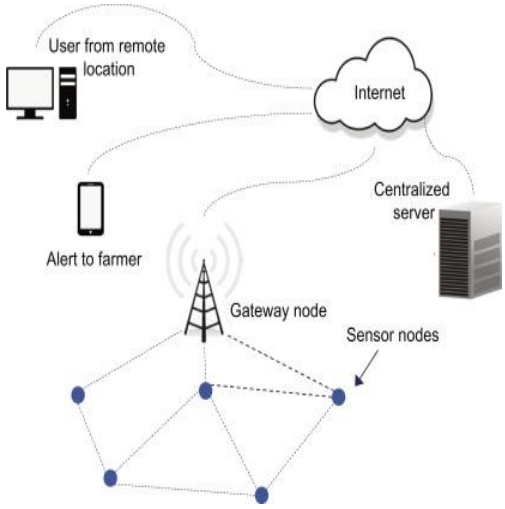
We want to use this project to help farmers to protect their crops.In today's world farmers are less aware of the technology advancement.We also want to make them aware. Firstly we will use the motion sensor to detect the invention of animals then sensors will send signals to farmers mobile and then farmer from mobile will turn on the buzzer to shrew animals away. A farm security system is technological way to help the farmers of our country. capable of protecting the farms from animal intruders. One of the ways to do so is by comparing selected facial features from image and a facial database.

Its work is to ward off the animals from fields. As this is an ultrasonic buzzer also introduced, Its loudly audible to animals. The buzzer switched on automatically only after animals are detected in the farm. GSM module is used to sending a message to the owner of farm after comparison output is positive or negative. If output is positive then wild animal detected then message send to the owner of farm using GSM. The audio unit consists of a microcontroller, audio player, memory to store tracks and the speakers. The microcontroller will be programmed such that when the camera detects an animal and send an image, a MOSFET will close a normal open circuit for a particular amount of time (say 35-45 seconds). GSM used to send the message to the owner of the farm if the animals cross the specified limit.

Figure(a): Circuit diagram of Farm Security System

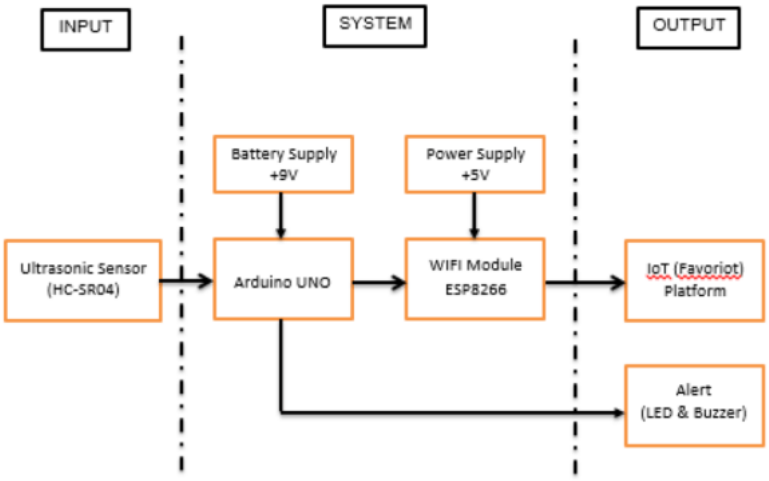
WORKING OPERATION IN FLOW CHART OF FARM SECURITY SYSTEM



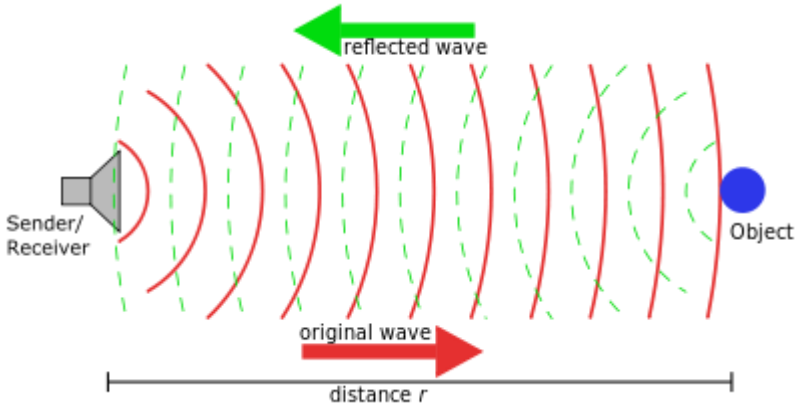


Figure(b): Flowchart of working of Farm Security System

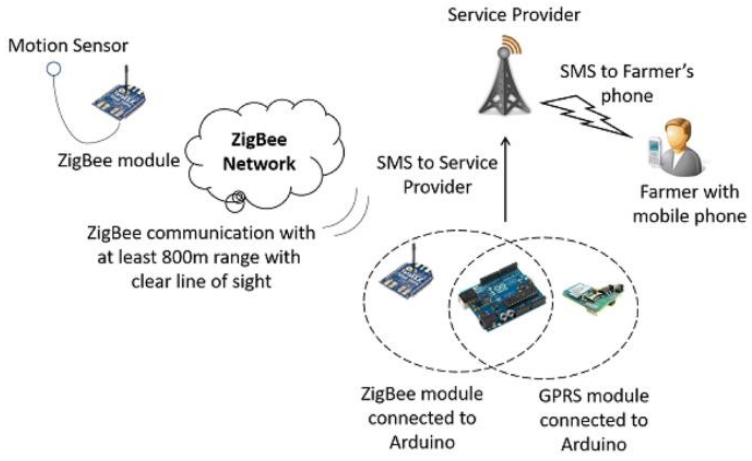
This flowchart shows that ho to operation will be done by the device by using ultrasonic sensor, GSM module for sending notification to users as that taking effective action for chasing animals by making them disturb produce unwanted excessive sound from buzzer.



Figure(c): Generalized simple block diagram of working of Farm Security System



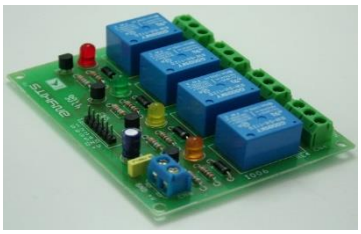
Figure(d): Ultrasonic sensor working of Farm Security System



Figure(d): General method of of working of Farm Security System.

EXPERIMENTAL SETUP AND PROCEDURE

Experiments were performed using an Arduino UNO, blade cutter, a Rely Module (4-Channel), Bluetooth Module and a Water sprinkler. The detail and specification of components of this project is given in a tabular form:

Components Name		Specifications
Arduino UNO		It has 14 digital pins (6 analog pins, 6 are used for PWM outputs) 16 MHz ceramic resonator It has a USB cable, a power jack port It accepts voltages between 7 and 20 volts It can be connected by a USB cable which is used for power supply or 9V external battery can be used.
Relay Module		4-Channel Relay interface board, and each one needs 15-20mA Driver Current. Both have to control by 12V and 5V input Voltage. Equipped with high-current relay, AC250V 10A; DC30V 10A. Standard interface that can be controlled directly by microcontroller (Arduino uno, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic active low). Indication LED's for Relay output status.

GSM Module		An open and digital cellular technology which is using for transmitting mobile voice and data.it is working in simple power operation, Supported in maintained band rate. Auto-connect to the last device on power as default. Frequency: 800MHz,900MHz
Buzzer		Material Used: hard plastic type Color: black Size: compact with device Using for producing sound for chasing intruders from farm.
Camera		Camera is using for capturing image of intruders that work as record as well as formation and use for further process of taking action Color: White
Ultrasonic Sensor		Capable to detect measuring distance by using ultrasonic wave. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. HC SR04 ultrasonic sensor has been used.

The proposed farm security system maintain environment of the farm as well as safety of the farm automatically by performing complete and equivalent coverage of abundant area. The block diagram of proposed structure is given in Fig (c)

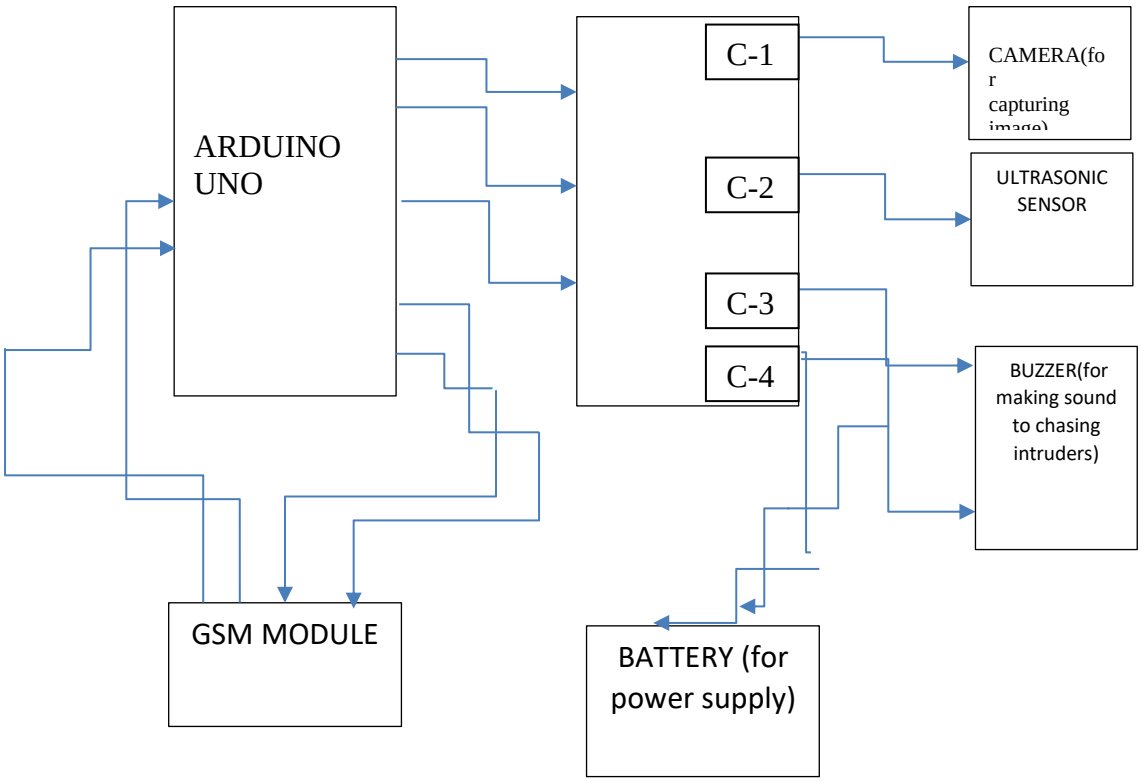


Figure (c): Block diagram of robotic lawn mower

The figure(c) shows the block diagram of "Farm security system". This design consists of an Arduino Uno which is the heart of the system, a Relay module, an ultrasonic sensor, buzzer, camera for capturing image based operation in security device. The goal of this project is to give security to farm from intruders attack such kind of animals, outsiders etc. when a intruders will enter into the farm then ultrasonic sensor will detect the intruders and send it to operational system of process. the Arduino sends a signal to the relay to switch on the buzzers for ensuring make sound of chasing intruders from farm then also give allowance to take a picture of that intruders as for further requirement of users for taking action for that. At a time GSM module will make working operation of sending notification to users mobile that can users knows about situation of firm.

The system can be monitored by using mobile phones. Here we have used Ultasonic sensor (HC04) which is used as a transmitter and receiver signal using ultrasonic wave and four channel relay module. Channel 1 is connected with Camera, similarly channel 2, 3, & 4 are connected with front buzzer, ultrasonic respectively. As operation of GSM will turn on for notify users to giving information throughout massaging as requirement or demand of situation of farm.

FACTOR CONSIDERATION DURING THE DESIGN

Well Maintained Environment

At the time of designing and make structural function for getting security well maintained environment is needed for better output of result. The camera should be well captured with sufficient light, and buzzer would be well sound maintained. The area of firm where work has done it has fulfilled all that conditions.

Good Efficiency

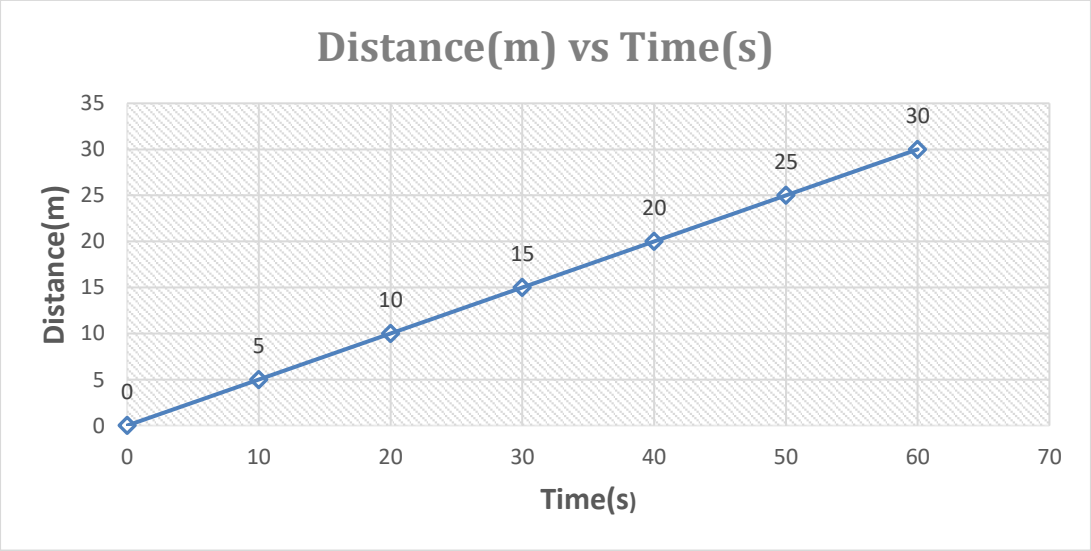
All that efficiency will depend upon the proper connection as well as order nomination of all parts of device that can give a good result with ensure of betterment.

Eco-Friendly

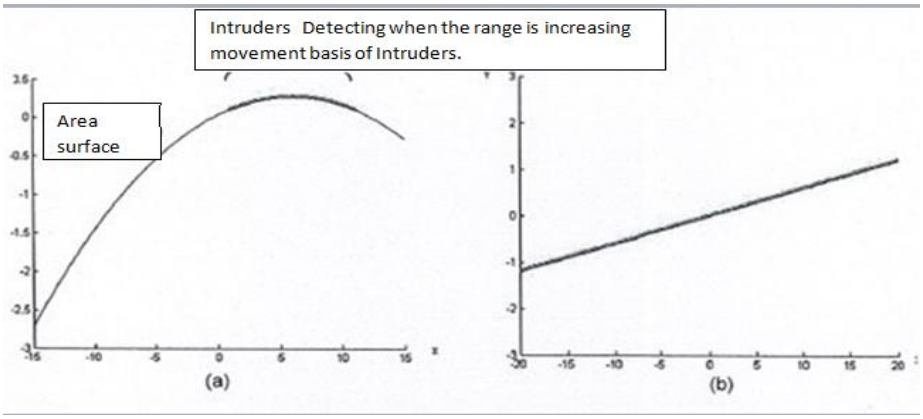
The device working process is very much eco friendly there is no collision in between components and the safe has been ensure for users.

RESULT AND DISCUSSION

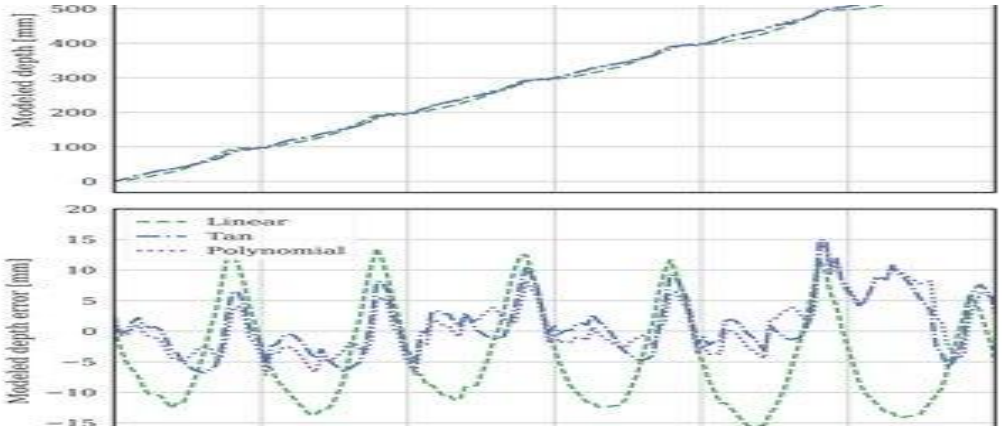
The system of security device considers the time and distance cover by ultrasonic sensor in a wide farm of paddy. Three factors are considered when it sated in different positions for intruders in various direction.



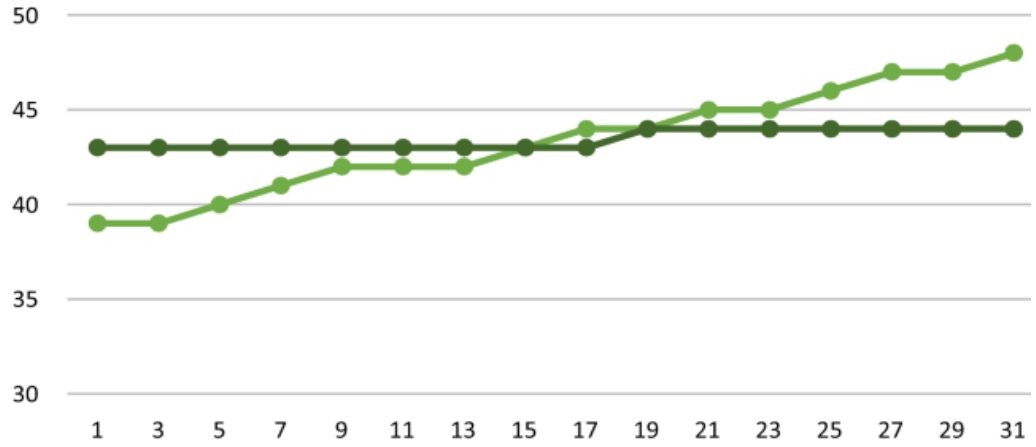
Figure(e): Distance vary with time (Basis of detection, Response)



Figure(f): Distance vary with area (Basis of detection, Response)



Figure(g):Error graph has been made for Distance vary with time (Basis of detection, Response)



Figure(h): Generalized graph which is the basis of long term result analysis of Distance vary with time

The graph fairly demonstrates that when the time is increasing the area distance covered by the sensor is also increased. That means when the intuders is passing through a particular area it will detect the intruders existence and will start taking operational step along with in a given time.

Several problems and factors related to design, selection of equipment and their application were confronted during the process of implementation of the device. In this section, the accomplishment of the proposed or introduced problem should be enterntained by users as per requirement.

Cost Analysis

S.no	Components Name	No. of Components	Price Per Piece	Total
1	Arduino UNO	1	400	400
2	PVC Pipe	2	100	200
3	Relay Module	1	260	260
4	9V battery for Arduino	4	20	80
5	GSM Module HC-04	1	380	380
6	Socket	1	450	450
8	Others		200	200
Total Cost = 1970(INR)				

III.CONCLUSION

Based on this study of farm security using automation system, the following limitations can be drawn:

The devised method was used to study four content, i.e., the efficiency of detection by sensor, capturing ability of camera, the battery life span and the design analysis of system. The model could be carried commercially a minimal amount of operating cost and production. Thus, the farm of the very vast field can be make safe easily without human effort. It is much portable and can be directed with smart phone so, one can easily operate it with their hand set. The gist of this job is, it can cut the give security of a specific area of flat area and also barrier have to be affect with along the way. This project is environmentally safe because it has been operated by ecofriendly components, In future more research would be possible to development with different features.

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