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Crop Field Protection from Intrusion of Animals using Wireless Technology

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Abstract: ***The problem of wild animal attacks on crop fields i.e. crop vandalization becoming a very common phenomenon in the state of Himachal Pradesh, Punjab, Haryana and many other states. Wild animals like monkeys, estray animals especially cows and buffaloes, wild dogs, bison's, elephants, deer, wild pigs and even birds like parakeets cause a lot of damage to crops either by running over them or eating them and vandalizing them completely.***
This leads to poor yield of crops. These animals attack on fruit orchards and destroy the flowerings and fruits. In both cases, this leads to significant financial loss to the farmers and orchard owners. The problem is so pronounced that sometimes farmers decide to leave the area barren due to these animal attacks.
The main aim of our project is to protect the crops from damage caused by animal as well as divert the animal without any harm. Animal detection system is designed to detect the presence of animal and offer a warning. In this project we used PIR and ultrasonic sensors to detect the movement of the animal and send signal to the controller .It diverts the animal by producing sound and signal further, this signal is transmitted to GSM and which gives an alert to farmers.
Keywords: IoT, Wireless Communication Network, Crops, Monitoring, Vandilization, GSM

I. INTRODUCTION

Crop damage caused by animal attacks is one of the major threats in reducing the crop yield. Due to the expansion of cultivated land into previous wildlife habitat, crop raiding is becoming one of the most conflicts antagonizing human wildlife relationships. There is an increasing damage of vineyards and farm lands that have resulted in a huge drop in production and about 1000 road accidents are also caused by these wild animals annually.

Due to over population it occurs a deforestation this results in shortage of food, water and shelter in forest areas. So, animals interference in residential areas is increasing day by day which affects human life and property causes human animal conflict but as per nature's rule every living creature on this earth has important role in eco-system. Elephants and other animals coming in to contact with humans, impact negatively in various means such as by depredation of crops, damaging grain stores, water supplies, houses and other assets, injuring and death of humans

The current methods used to counter this problem include the use of electrified welded mesh fences. Other traditional methods applied by farmers include the use of Hell kites, Balloons, Shot/Gas guns, String & stone, etc. These solutions are often cruel and ineffective. They also require a vast amount of installation and maintenance cost and some of the methods have environmental pollution effect on both humans and animals.

The chemical products used to prevent these animal attacks have an application cost per hectare and their effectiveness is dependent on weather condition, as rain may cause a dilution effect.

Farmers in India face serious threats from which one is damage by animals resulting in lower yields. Traditional methods followed by farmers are not that effective and it is not feasible to hire guards to keep an eye on crops and prevent wild animals. Since safety of both human and animal is equally vital. So, animal detection system is necessary in farm areas.

Our method is based on an animal friendly ultrasounds generator, which does not produce physical or biological harm to the animals nor sounds harmful to humans.

The aim of the project is to address the problem of crop vandalization by wild animals. The project aims to provide an effective solution to this problem, so that the economic losses incurred by our farmers are minimized and they have a good crop yield.

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II. METHODOLOGY

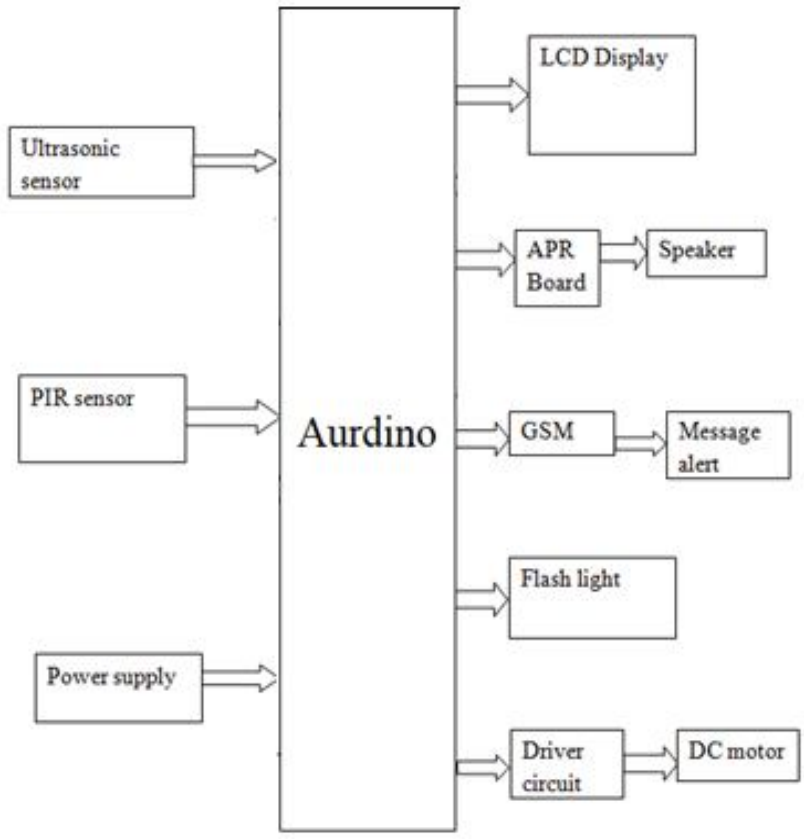

Fig. 1 Block diagram of proposed system

The above block diagram contains various sensors that are used for sensing the various parameters. It mainly deals with five modules and each module does a work which produces more efficient process to monitor the crop field .Our system is designed for the purpose of reducing man power and time consumption. Here the system consists of motion sensor & ultrasonic sensor. Each performs their respective action.

The project is crop field protection from intrusion of animals using wireless technology which protects the crop from damage caused by animals and birds as well as divert the animal without any harm. The animal detection system is designed to detect the presence of animal and offer a warning. The above circuit diagram includes the various sensors are connected to arduino board such as motion sensor, ultrasonic sensor, LDR etc and other components are APR board, LCD,DC motor etc .

When any animal tries to enter into the farm then the ultrasonic sensor detects the presence of animal and it sends signal to the arduino board. Then the APR board generate harsh sound to divert the path of animals. Due to this harsh sound animal will divert their path. The message and call will be given to the farm owner. In message there is facility that it shows the direction of intruded animal i.e. it shows that 'Animal is just entered from left side'. Also any animal tries to enter in the farm then the electric fence is provided which will give small amount of shock that will not cause any severe harm to the animal. The intension is only to divert the animals' path. Similarly when birds tries to enter in the farm then the motion sensor senses the presence of birds and give signal to arduino board. Then the agricultural sling start to rotate to divert the path of birds. Also there is light facility at night time. When resistance of LDR decreases then flash light will be turn on. Due to the high intensity of light animals will not try to enter in the farm at night time too.

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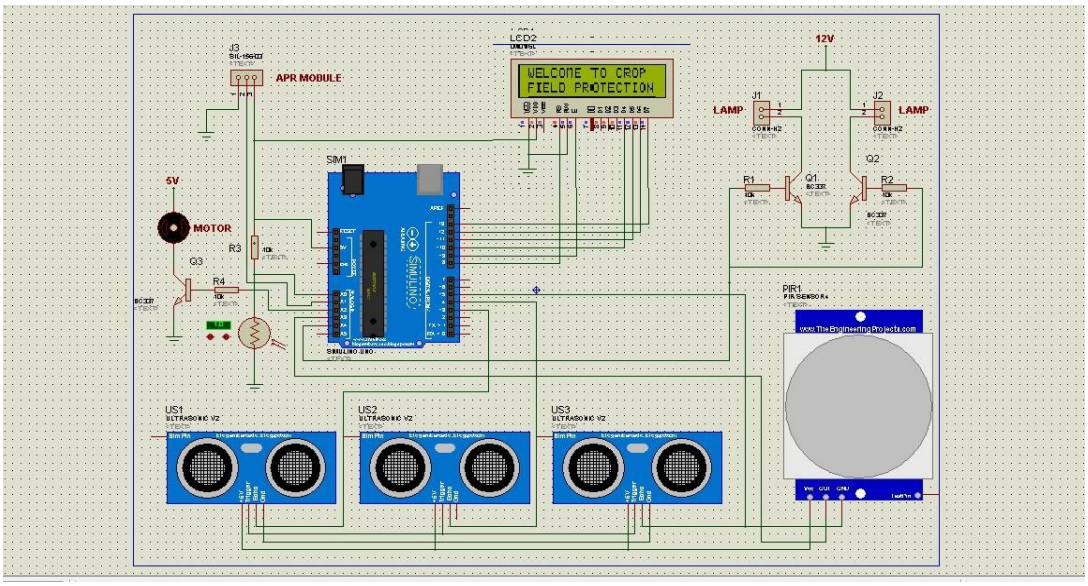

Fig. 2 Design of proposed system

A. Components used in Proposed system

1) *PIR Sensor (Passive Infrared Signal):* In the circuit diagram when the animal is enter into the farm area . the PIR sensor detect the presence of bird and send input signal to arduino board .Immediately APR board will on and message will send to the farmer. The LCD display the presence of birds and message and call will go the farmer. The PIR sensor operates on 3.3 to 5volt DC .the PIR sensor consist of pyroelectric sensor and Fresnel lens . The range of PIR sensor is 140 degree in conical manner but as per the project requirement it set on 60 degree .A passive infrared sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m .
2) *Ultrasonic Sensor:* The ultrasonic sensor generates the high to low pulse and when the animal enter into the farm then the pulse will cut and reflect back in the form of echo. It calculates the time taken between sending sound waves and receiving echo. Working voltage of ultrasonic sensor is 5V. The HC-SR04 ultrasonic sensor module is used in this project. The module includes ultrasonic transmitter, receiver and control unit.
3) *Light Dependant Resistor:* An LDR or light dependent resistor is also known as photo resistor, photocell, photo conductor.It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface.When the light falls on the resistor, then the resistance changes. These resistors are often used in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light. A typical light dependent resistor has a resistance in the darkness of 1MOhm, and in the brightness a resistance of a couple of KOhm.These devices depend on the light, when light falls on the LDR then the resistance decreases, and increases in the dark.When a LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease.
4) *APR board (Audio video Recorder and Playback):* When the animal enter into the farm area the PIR and ultrasonic sensor detect the presence of the animal and send an input signal to the controller, Immediately, the APR board will be on. Thus the APR board generates the harsh sound for diverting the path of animal. The aPR33A3 are powerful audio processor along with high performance audio analog-to digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A3 incorporates the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A3 because of its integrated analog data converters and full suite of quality enhancing features such as sample-rate convertor. The aPR33A3 is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch. It is suitable in simple interface or need to limit the length of single messages.

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5) *Arduino:* The project includes arduino board as a interconnector of input and output. Arduino is microcontroller board based on ATmega328P. It has 14 digital input/output pins of which 6 can be used as output ,6 analog input a 16MHZ quartz crystal ,a USB connection ,a power jack ,an ICSP header and reset button . It has inbuilt ADC and DAC so need to connect externally. The range of operating voltage is 5 to 12 Volt .

6) *GSM Modem:* GSM is used to monitor continuously intrusion by animal in the agricultural field. If any changes take place then immediately the message is send to the farmer with the help of GSM. This GSM transmit the full information about the field to the farmer. The interconnections of various components from the complete circuit diagram which was used to access control, using this module as per the project requirement, SMS , calling these commands are used in this project. The project uses GSM800A because it has more range than GSM900A .

III.RESULT

The project Crop Field Protection from Intrusion of animals using Wireless Technology mainly contains two sensors one is Ultrasonic sensor and another is Motion sensor. These two sensors plays vital role in diverting animals and birds from crop. The project setup is as shown in figure-3. Some of the results are shown below with figures.

Fig. 3 Real Setup of Project

The animal is detected by using ultrasonic sensor and it detects distance of animal in centimetres which is as shown in fig.4. Here the 65 detects what is the distance of animal in centimetre.

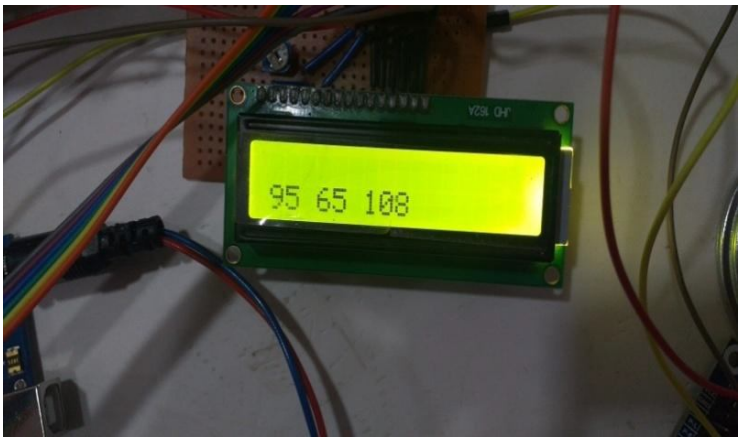

Fig. 4 Distance detection of ultrasonic sensor

It also displays that from which side the animal is entered either it is from left side, right side or from back side. The above image indicates the animal is entered from back side. After this the animal is detected and speaker starts to generate harsh sound due to which animal gets diverted and it displays on LCD that from where the animal is entered.

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Fig. 5 Display of detection of animal entered

After displaying on LCD the farm owner knows that there is intrusion of animals or birds in farm by providing call to him and also the message will be sent to the farm owner in which he will know about the side of intrusion of animal is as shown in figure.

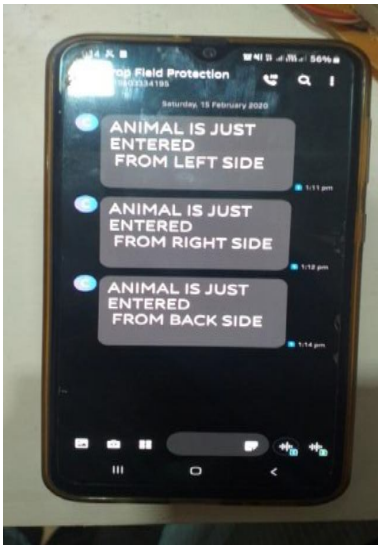

Fig.6 Messages when animal intruded

IV. CONCLUSIONS

The problem of crop vandalization by wild animals has become a major social problem in current time it requires urgent attention and an effective solution. Thus this project carries a great social relevance as it aims to address this problem. Hence we have designed crop field protection from intrusion of animals using wireless technology. We have designed system in which sound is played and we used LDR it will focus the light, so that wild animals will not enters into the farm. It will divert its path. GSM module sends message to famer to alert him. The wild animals are detected by ultrasonic sensor and birds can be detected by using motion sensor. From this it is concluded that the design is very useful and affordable to the farmers. The design system will not be dangerous to animals, birds and human being and it protect the farms. And if crop will be protect then the production of crop will be increases. The same system can be used in differebt applications

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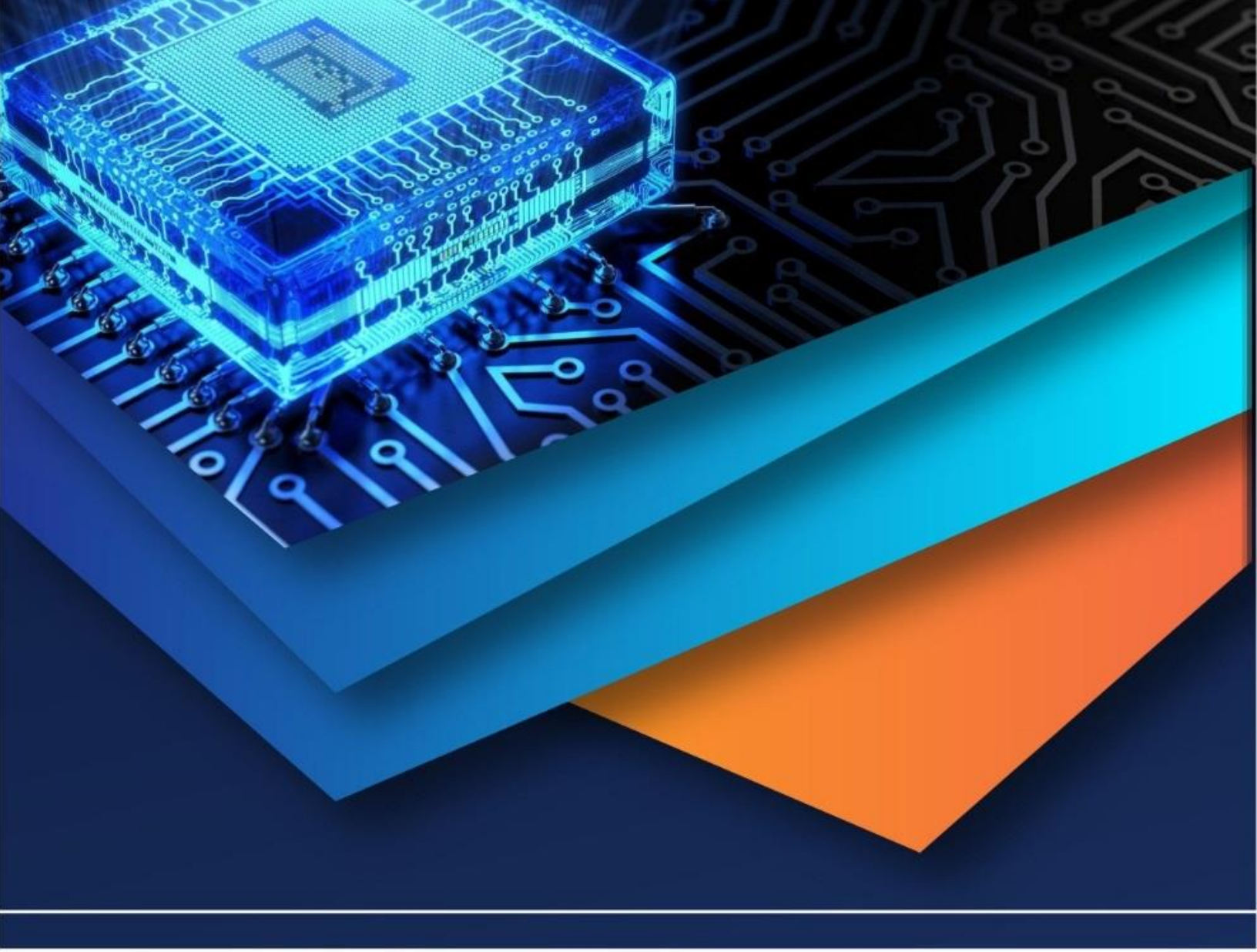

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