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Protection of Plantation from Wild Animals Using Wireless Sensor Network

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Abstract--- *The main objective of the project is to design a protection system for the farmland monitoring from wild animals using wireless sensor network. In current scenario, many farmers face the crisis of decrease in the crop yield. This may be due to various problems, one such problem is the intrusion of animals in the farmland and destroying the plantation. So, to address this major issue an enhanced system is created to protect the farm from disturbance of wild animals. The system also ensures that it is not hazardous to animals and humans. In this proposed work, sensors such as PIR sensor (passive infrared sensor) and vibration sensor are used. The PIR sensors are fixed along the boundary of the farm which detects the motion of the object and vibration sensors are laid on the land few meters outside the farm boundary to sense the footsteps of the animal trying to enter the farm. Whenever some animal passes near farm area PIR sensor detects the motion and microcontroller displays motion detected in display unit of farm. If still the animal is approaching the farm, the vibration sensor senses the foot vibrations and the sensor value is given to microcontroller, alert message is displayed in farm display unit and also the farm manager is notified by alert message using GSM module about some animal tried to enter the farm area.*

Keywords--- *Wireless Sensor, Animal, Form Land, Micro Controller and PIR Sensor.*

I. INTRODUCTION

The key objective of the farm land protection system is to create a protection system for the farmland from intrusion of animals using wireless sensor network [1]. The lower production from the farm may due to pests, usual disasters, thefts and damage due to animals [2,3,4]. The wild animals damages the form lands near by the forests especially during the summer. It is due to the shortage of water in the forests particularly. No serious of measures taken by the government authorities to protect the form lands from the wild animals. Wild animals when enters to the field crops it will damage them. Automated systems are developed making decision spontaneously without input from others [5,6,7]. To overcome this serious problem, an enhanced system is being developed for farm protection using sensor network wirelessly [8,9]. The protection system ensures that the animal entry to be prohibited from the protected area and assures no harm is caused to the any of animal species. In this proposed work aimed to detect animals through sensors and produces sound whenever animals try to enter the farm. Alert messages are sent to the managing person using GSM module to take preventive measures according to the need. It alerts the farm manager about the entering of the animals into the farm.

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1.1 Role of wireless sensor network

Wireless sensor network (WSN) is a distributed sensor nodes connected via wireless i.e without wires and capable of detecting or monitoring the environmental changes [10,11]. The sensor nodes will communicate each other in the wireless network. The number of sensor nodes required for a particular WSN depends on the area of coverage. The sensor nodes normally distributed in a random basis. Each sensor node consists of transducer (sensor), micro controller or microprocessor, transceiver and battery. The transducer (sensor) in the WSN produces electrical signal in response to changes happening on the sensor [12,13]. Microprocessor or micro controller process the signal generated by the sensor and sends to the transceiver. The transceiver is a devices combines transmitter and receiver in the same device. The transmitter transmits the processed signal to the Global System for Mobile communication (GSM) module or display unit. The display unit usually Liquid Crystal Display (LCD) unit or Light Emitting Diode (LED) unit. The WSN is a battery operated device [14]. The battery used in WSN which powers the sensor and microprocessor or microcontroller. Normally the batteries used are rechargeable batteries. Each sensor node used in WSN are miniature and portable. Thus WSN senses the environmental changes and process it then conveys the information or displays the information.

In the existing system, passive infrared sensor (PIR) is used which detects only the motion of the object and produces sound. This may have led to disturbance in case of any object other than animal. Other system such as fiber buried sensor are used, the maintenance cost is high. So, in proposed work an enhanced protection system is designed of low cost and with high efficiency by making use of two sensors PIR and vibration sensor network to prohibit the animal from entering the farm without causing any harm to the animal and disturbance to the nearby vicinity. Also, the manager receives the message of alert whenever any animal makes a try to enter the protected area using GSM.

1.2 Different control methods for wild animals

Different types of animal species scare by different things. The almost all the wild animals such as monkeys, elephants, lions, dears will fear to the loud sound or noise. They also will have fear for the smoke, fire and red hot chili peppers when sprayed on them. Any of these above methods can be incorporated in the proposed system to repel the particular type of animal near the farm. But care is taken for protection of wildlife so that they are not harmed by any of above control methods.

The available wild animal protection system is designed to protect the form lands from the animals but not to damage them. If animals get harmed such systems, then there will be decline of particular animal in that area which will ultimately have severe impact on the ecological cycle. So, this proposed work assures that the farm is protected as well as it is not hazardous to the animals.

II. PROPOSED SYSTEM DESIGN

The block diagram of farm land protection system is shown in figure 1. The proposed system consists of ATMEGA 328 micro controller, vibration sensor, GSM module, display unit, buzzer and power supply.

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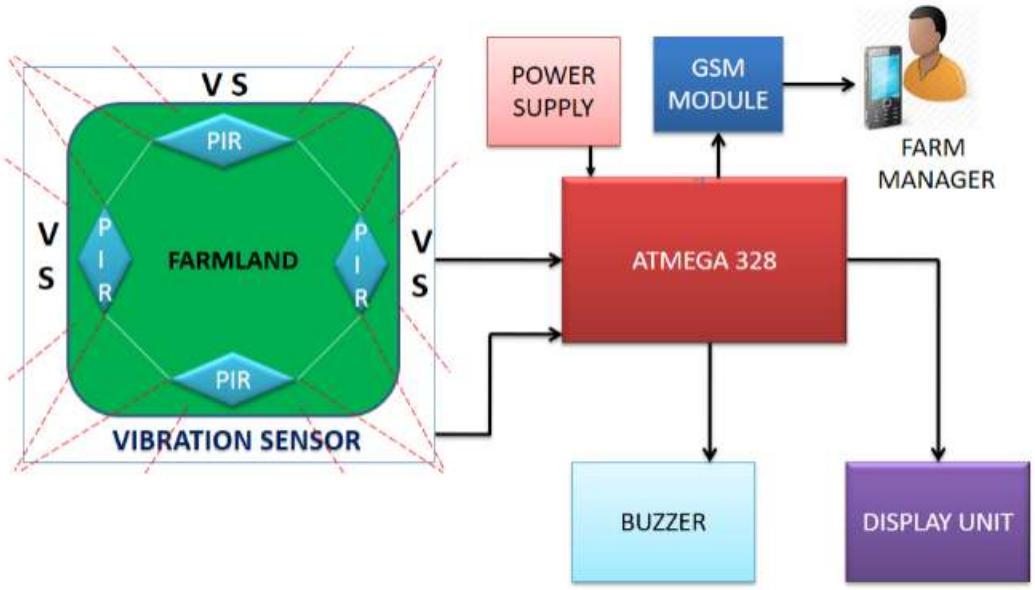

Figure 1: Farm land protection system

In the proposed system, the farm boundary is covered with PIR vibration sensors such that whole farm boundary is sensed when animal enters in to the farm land. Generally, the vibration sensors are laid underneath the soil to sense the footsteps of the object entering the farm. When the farm is not intruded by any animal then the LCD displays "normal condition". When an animal comes around the farm vicinity its motion is detected using PIR sensor and sensor value is given to ATMEGA 328 microcontroller which displays the message "motion detected" in display unit of farm. Also it displays the message in the farm manager's mobile phone via GSM module. If the animal motion is such that it is approaching the farm then the vibration sensor put underneath the soil which is few steps away from farm boundary senses the footsteps of the animal coming and this sensor value is provided to the microcontroller and the buzzer sound is produced. Buzzer is used just for prototype but in actual implementation speakers can be used to get the high pitch sound and alert message is sent to farm manager using GSM. The power supply is obtained via rechargeable battery which supplies necessary powers to the microcontroller.

2.1 Program window

The programming platform used here is Arudino IDE, the code is written, uploaded, compiled and executed here. The Arduino language is merely a set of C/C++ language, so its easy to write a code for the proposed work. The code is written in editor window and compiled for bugs. Then, it is uploaded in the Arduino board through help of USB. This is indicated by blinking of transmitter and receiver LED.

Once the code is uploaded to the board, in beginning normal condition is displayed when there is no animal in intrusion. If any animal is passing farm area the PIR sensor detects its motion and prints value '1' and motion detected is displayed in display unit otherwise it prints '0' in the serial output monitor window. And whenever the animal footsteps are detected by vibration sensor, its value becomes high and an alert message is given to farm manager.

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III. RESULTS AND DISCUSSION

The proto type of the designed farm land protection system is given in figure 3. The designed prototype would be useful for the farmland protection for the farmers for small or large plantation area. The developed prototype is portable and cost effective because the whole prototype is designed using vibration sensor, microcontroller, GSM modules and display unit which is simple system compared with traditional existing methods for prohibition of animals entering to the farm lands.

Figure 3: Prototype of the proposed system

IV. CONCLUSION

In the proposed system, an enhanced system for farmland protection is designed to avoid the entering of the animals into the farm using wireless sensor network i.e. combination of PIR sensor and vibration sensor is used. The PIR sensor monitors if any animal passes around the farmland area and alert is given to farm using display unit. Still if the animal is about to enter the farm the vibration sensors laid under the soil which is few distance away from farm fence, it detects the vibration of footsteps of animal and produces a high pitch sound so the animal gets diverted from entering the farm. And the farm manager receives the message of alertness using GSM that some animal tried to enter the farm. This system ensures that the animal gets repelled from the farm area without. The proposed system is of low cost and efficient security system.

In future, the farm land system designed with heat sensors which may detect the heat energy produced by the animals. So that whenever animals entering to the farm lands may be protected effectively.

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