SMART INTRUSION DETECTION SYSTEM FOR CROP PROTECTION AND MONITORING

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***Abstract*—** Drought is a major issue faced by farmers these days next to crop vandalization. Since flora and fauna co-exist together it is very vital that we monitor the animals that live close to the crop fields. The main focus on this paper is to provide solution to resolve crop damage by animals. Smart intrusion detection system aims to help farmers detect the presence of animal and offer a warning. Use of microcontroller and camera help in the detection of movements made by the animal(s) and further more send signal to the controller which in turn producing a signal to distract the animal. The basic ideology behind this project is prevention is better than cure so predicting the presence of animal near the crop fields and alerting the farmer so protect the crops.

***Index Terms*—Animal detection, Prevention, Sensor, GSM, Camera, Speaker.**

I. INTRODUCTION

Agriculture is the economy's cornerstone, but animal intrusion in farm fields can result in major crop losses. Indeed, the farmer's dilemma had become a big issue by the end of the century of greatest agricultural growth. While there are different approaches aimed solely at human intruders, the entry of wild animals has ruined many village farms. Farmers' traditional techniques are ineffective, and it is not practical to employ guards to keep an eye on crops and keep wild animals at bay. Vandalism of crops is becoming more prevalent in states where agriculture is pursued, such as Tamil Nadu, Punjab, and Haryana. Elephants, rodents, buffaloes, and bison invade the field and kill the fields. As a result, many farmers face financial difficulties and are forced to relocate due to repeated animal attacks. This machine assists us in keeping wild animals out of farmlands, and it is often automatic based on the need, meaning there is no worker involved, saving time and avoiding crop loss.

II. OBJECTIVE

Electric fencing is one method of protecting crops from wild animals; in other areas, farmers burn elephant dung or other materials that combust and produce thick smoke, causing air quality problems. Farmers would not have to deal with these issues if they use our smart intrusion detection system. Our system's sole purpose is to prevent wild animals from entering the property. We are using a global system for mobile communication that will transmit a message to the farm owner in advance. The camera is used to track the arrival of intruders or creatures, and would be telecast to the owner; at night, we use a flash light to get clearer images of the animals. Our system often addresses the need for a practical approach by allowing the farmer to switch the system on or off using a timer or manually depending on the situation.

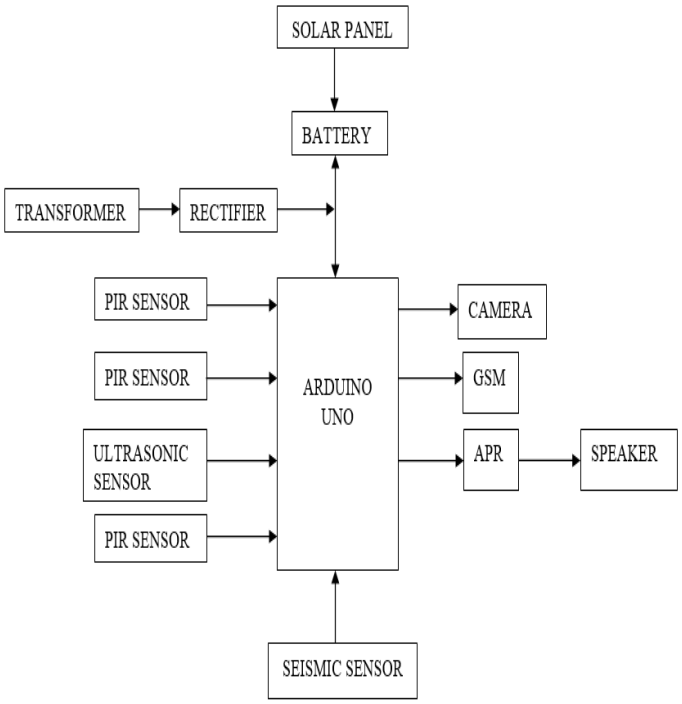
III. SCOPE

The aim of our system is to establish a farm protection system that prohibits animals from accessing the farm. It also protects crops from damage. It is used to detect animal interference, warn the farmer, and protect the crop from wild animals through the use of sensors. The GSM module is used to submit a prior warning to the farmer. When the sensor is activated, a buzzer sound is made, causing wild animals to flee the field's entrance. Our system's biggest benefit is its low power consumption.

IV. PROPOSED SYSTEM

The core of the system is the Arduino uno board. Passive Infrared sensor (PIR), Ultrasonic sensor and Seismic sensor are interfaced as input to the board. Within 10 meters, the PIR sensors sense movement. When the movement is detected in the area, this sensor goes to high mode and the message will be sent to the owner. The Ultrasonic sensor emits the ultrasonic sound waves. When the intruder is detected these waves are reverted back to the sensor from which the distance of the intruder is detected.

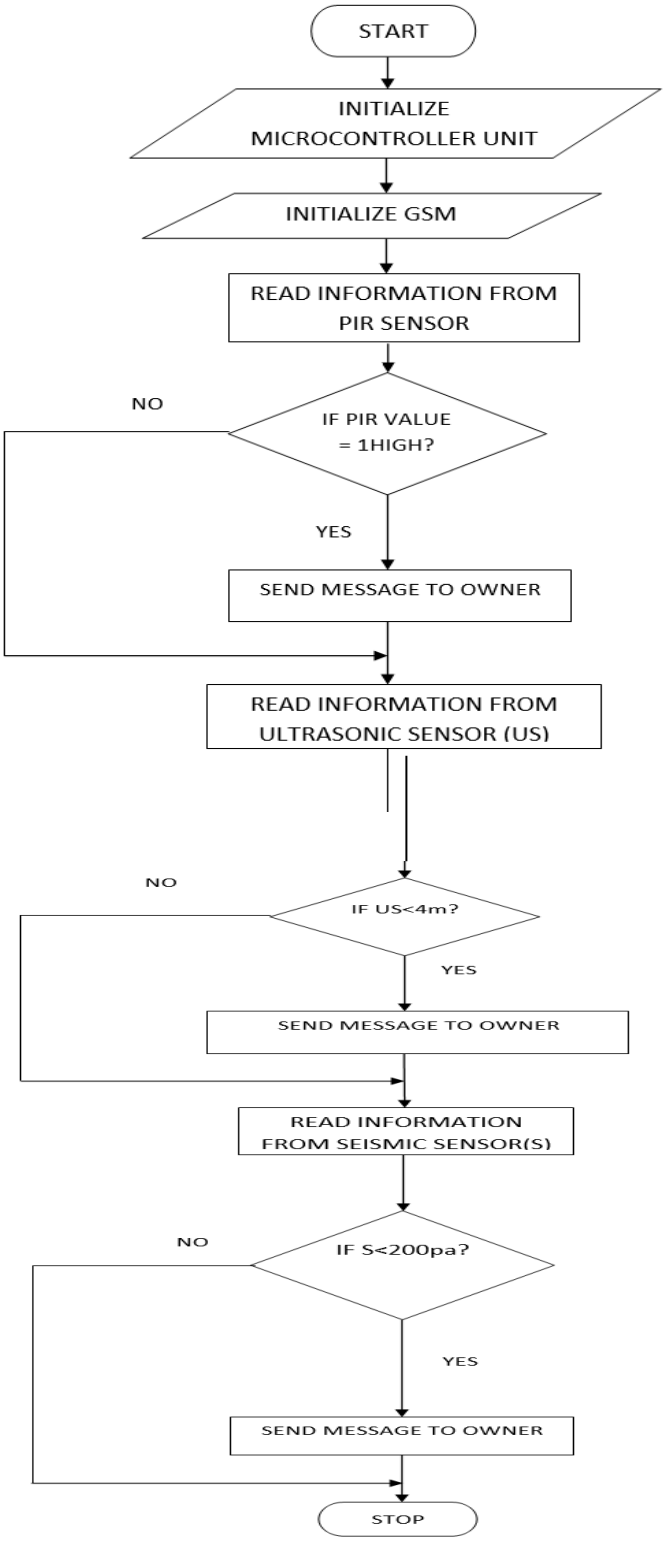
The owner can view the intruder by using the continuously monitoring camera. The seismic sensor records the vibrations produced by the intruder. This sensor is mainly used to predict the elephant entry. When the intrusion is detected by these sensors, speaker will turn on to produce cracker sound which scares the animals and birds and prevent their entry into the farm. The intrusion is alerted to the owner with the message which is sent through GSM. This messages also consists of the value of PIR sensors. According to the requirements the owner can switch on or switch off the system by ensuring complete security to the farm. During daytime, solar panel is used to produce power for the system. At night, the stored energy is utilized to run the system. The Fig. 1 shows the block diagram of the proposed system from animals using Arduino Uno.



The proposed system is classified into four parts – Solar panel part, sensor part, controlling part, alarm part. Three PIR sensors, one ultrasonic sensor, and one seismic sensor make up the sensor portion, which aids in the detection of any animals or birds near the crop area. PIR sensors can sense activity up to 10 meters away. By using an ultrasonic sensor distance is measured. Camera is enabled in such way that the live feed is visible to the farmer at all times. Using GSM an alert will be sent to the farmer in case of animal presence near the field which will in turn activate the speaker to scare the animal away from the crops. This proposed system uses renewable energy (the sun) in the form of solar panel which stores the energy. During daytime, solar panel is used to produce power for the system. At night, the stored energy is utilized to run the system.

V. FLOW CHART

The flow chart for the proposed system is as shown in the figure below:



The Arduino Uno board and GSM are set up first. The values of the three PIR sensors are read and fed into the microcontroller. The system reads the ultrasonic sensor value when the PIR value is high or 1.

A message alert is sent to the registered mobile number when the value is less than 400centimeter. The ground vibrations are also predicted by the seismic sensor. The speaker is activated when the pressure value is less than 200.

VI. HARDWARE

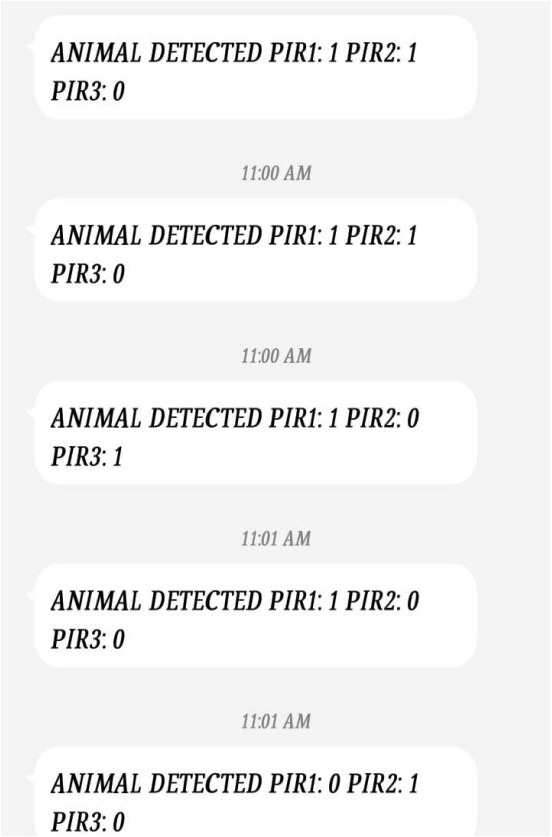
The Arduino UNO, also known as AT mega 328p, is the system's main component. It's an 8-bit RISC microcontroller with high performance and low power consumption. PIR sensor, seismic sensor, ultrasonic sensor, camera, GSM module, and speaker are also included in this device. The PIR sensor generates infrared light, which is used to track motion. To produce stable color images, this machine employs an ESP32 model sensor. Seismic instruments detect acceleration by detecting vibrations.

The distance at which the animal is entering the farm is determined by an ultrasonic sensor. These components are smaller, easier to use, more durable, and use less energy. For text transmission in the M2M interface, this system uses a SIM800L quad-band type GSM module. When the system detects the intruder, sound alarm is created by the speaker. Solar energy is used in the proposed system in the form of solar panels that store the energy. During the day, solar panels are used to fuel the device. The accumulated energy is used to power the battery at night.

VII. RESULT

There are three PIR sensors in the device. The first PIR sensor is placed 25cm from the ground level to detect the animals like mouse and rabbit. The second PIR sensor is placed 1metre from the ground level to detect the animals like deer, goat, etc. The third PIR sensor is placed 3metre from the ground level to detect the human intrusion and also animals like elephant, giraffe, etc. When the intruding animal is detected, the Ultrasonic sensor detects the distance at which the animal is approaching the farm. Studies show that the ground vibration caused by each animal takes a unique form.

These vibrations are detected by the Seismic sensor. This sensor is mainly used to detect elephant intrusion. The appearance of an animal is shown on the LCD. Farmer can continuously monitor the farmland by using the camera attached to the system. Once the animal is detected, artificial cracker sound is made by the speaker to make the animals run away from the field to prevent the damage of crops. The proposed device stores solar energy in the shape of a solar panel. During the day, solar panels are used to power the system. The machine is powered up at night using the stored electricity.



Message alert is sent to the farmer about the distance at which the animal is approaching and also the readings of PIR sensor.

VIII. CONCLUSION

It is the primary duty of every citizen is to prevent the Agricultural farmlands. Many crop fields are often destroyed easily by the wild animals. Hence, our proposed work has used PIR sensor, Ultrasonic sensor and Seismic sensor to efficiently detect the movement of the intruders. As the camera is used, the animal entry can be easily monitored by the farmer. The system does not wait for the farmer to reach the field to prevent the animal from damaging the crops. Instead, the machine emits an artificial cracker sound to startle the animal and cause it to leave the farmland. To protect farmlands from predators, the device is successful and functional.

IX. FUTURE SCOPE

An IoT network can also be used for cloud computing the links and controlling the computers, in addition to the proposed thesis. There is a lot of space to improve the basic prototype by allowing for enhanced home automation in both urban and rural areas to get the most out of IoT in everyday tasks. Furthermore, with this advantage, the losses incurred by birds can be significantly reduced.

X. REFERENCES

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