Protection of Crops from Wild Animals Using Intelligent Surveillance System

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Abstract- Surveillance plays a major role in many fields be it at home, hospitals, schools, public places, farmlands etc. It helps us to monitor a certain area and prevent theft and also provides proof of evidence. In the case of farmlands or agricultural lands surveillance is very important to prevent unauthorized people from gaining access to the area as well as to protect the area from animals. Various methods aim only at surveillance which is mainly for human intruders, but we tend to forget that the main enemies of such farmers are the animals which destroy the crops. This leads to poor yield of crops and significant financial loss to the owners of the farmland. This problem is so pronounced that sometimes the farmers decide to leave the areas barren due to such frequent animal attacks. This system helps us to keep away such wild animals from the farmlands as well as provides surveillance functionality.

Index Terms- Surveillance, monitor, unauthorized people, human intruders, leave the areas barren

1. INTRODUCTION

Animal attacks in India are a common story nowadays. Due to the unavailability of any detection system these attacks kill villagers and also destroy their crops. Due to lack of proper safety measures, these villagers are left helpless to their fate. Therefore a proper detection system could help save their lives and also to the preservation of crops. Also the crops of villagers are destroyed due to frequent interference of animals. The crops and paddy fields cannot be always fenced. So the possibility of crops being eaten away by cows and goats are very much present. This could result in huge wastage of crops produced by the farmers. To make the best use of mobile communication technology, the objectives of this paper therefore utilizes global system for mobile communication (GSM) and provide short message service (SMS). This system helps us to keep away such wild animals from the farmlands as well as provides surveillance functionality. It has been found that the odour of rotten egg helps to keep the wild pigs and deer from destroying the crops, hence the farmers manually spray the rotten egg solution on their fields, and firecrackers are used to ward off the wild elephants that destroy the crops.This project is based on surveillance with an animal ward-off system employed in farmlands in order to prevent crop vandalization by wild animals. In addition to providing protection this system distinguishes between an intruder and an authorized person using RFID's, various PIR sensors are deployed in the area to detect any motion and hence turns ON a camera when movement is detected, thereby providing real

time monitoring. It involves automation of certain methods used to prevent the wild animals from entering the farmlands and destroying the crops, an electronic fire cracker (for bigger animals, like elephant) and a rotten egg spray (for smaller animals like wild pigs and deer) which have been found useful to ward off the wild animals, we use Haar feature based cascade classifiers for object detection to distinguish between the animal and human. When such intrusions occur, a message will be automatically generated and the cameras employed are turned ON which capture an image and start recording the video for some time which will be stored on the SD card as well as stored on cloud i.e, dropbox, the land owner can then view the video on any smart device, as well as access it later. All the sensors and components are interfaced to the Raspberry pi board. Hence we come up with such a product that can be very useful for farmers, it prevents the loss of crops and increases the yield, also protects the farm from intruders.

2. LITERATURE REVIEW

T.Gayathri et al, [10] proposed the system for monitoring the growing status of the corn (maize) plant continuously and intimate the agriculturist using wireless sensor network (WSN). But in practice, cultivator faces too much effort in the farmland. This paper makes eases the work of the farmer in cultivated land through the usage of different kind of sensors. The two LDR sensors are interfaced with PIC16F877A microcontroller whereas its top array receives solar radiation for supply current and the bottom of the LDR array is for measuring leaf area index (LAI). The humidity sensor will compute the moisture level in the corn field, if the level decreases, then it automatically switches ON the DC motor. All the particulars of farmland are sent to the farmer through GSM and revel in the LCD screen. The

temperature sensor will find the intensity of heat present in the soil. PH sensor is used to find the soil alkalinity which is essential for plant nutrition.

V Nainwal, et al, [16] Sensors are used to detect the presence of objects in the surveillance area and the information is collected over time to extract the event of interest. The information gathered by the surveillance camera i.e., video or still images could be used for further analysis and detection of the intruding object. This system does not utilize advanced techniques for alerting the owner of that area.

Sneha Nahatkar et al, [1] proposed a home embedded surveillance system which evaluates the development of a low cost security system using small PIR (Pyroelectric Infrared) sensor built around a microcontroller with ultra-low alert power. The system senses the signal generated by PIR sensor detecting the presence of individuals not at thermal equilibrium with the surrounding environment. On detecting the presence of any unauthorized person in any specific time interval, it triggers an alarm & sets up a call to a predefined number through a GSM modem. After the MCU sends the sensor signals to the embedded system, the program starts the Web camera which then captures the images which can be viewed and analysed later.

Puja G, Mohammad Umair Bagali proposed the system. This project is based on surveillance with an animal ward-off system employed in farmlands in order to prevent crop vandalization by wild animals. In addition to providing protection this system distinguishes between an intruder and an authorized person using RFID's, various PIR sensors are deployed in the area to detect any motion and hence turns ON a camera when movement is detected, thereby providing real time monitoring. It involves

automation of certain methods used to prevent the wild animals from entering the farmlands and destroying the crops, an electronic fire cracker.

3. EXISTING SYSTEM

The existing systems mainly provide the surveillance functionality. Also these systems don't provide protection from wild animals, especially in such an application area. They also need to take actions based on the on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering such restricted areas. Also the farmers resort to the other methods by erecting human puppets and effigies in their farms, which is ineffective in warding off the wild animals, though is useful to some extent to ward off birds .The other commonly used methods by the farmers in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous methods.

4. STRATEGIES TO PROTECT CROPS

Successful farmers always seek to determine the satisfactory level of wild animal crop protection using one of the following technologies:

1. *Agricultural fences*
   - *Wire fences*
   - *Plastic fences*
   - *Electric fences*
2. *Natural repellents*
   - *Smoke*
   - *Fish or garlic natural emulsion*
   - *Chilli peppers*
   - *Lavender and beans*
   - *Egg based repellent*
3. *Chemical repellent*
4. *Biophysical barriers*
5. *Electronic repellent*
   - *Ultrasonic Electronic repellent*
   - *Sonic Electronic repellent*

5. OBJECTIVES AND SCOPE OF STUDY

1. To design a security system for farm protection
2. Prohibit the entry of animal into the farm
3. Use GSM module for alerting us
4. Design a system that sounds through solar animal repellent when animal tries to enter into the farm
5. In night flash light will focus on that side.
6. The camera continuously monitors the fields and provides the video feed to the farmer at home 24×7 for the whole day
7. The system ensures that the alarm is not triggered by the presence of a human in the field, or via any random motion.
8. The system is capable of turning On/Off automatically and warding off the animals thus protecting the fields from any damage also we can setup a Timer as per farmer's requirement

6. PROPOSED SYSTEM

The proposed system uses a Raspberry Pi board which forms the main heart of the system; the different
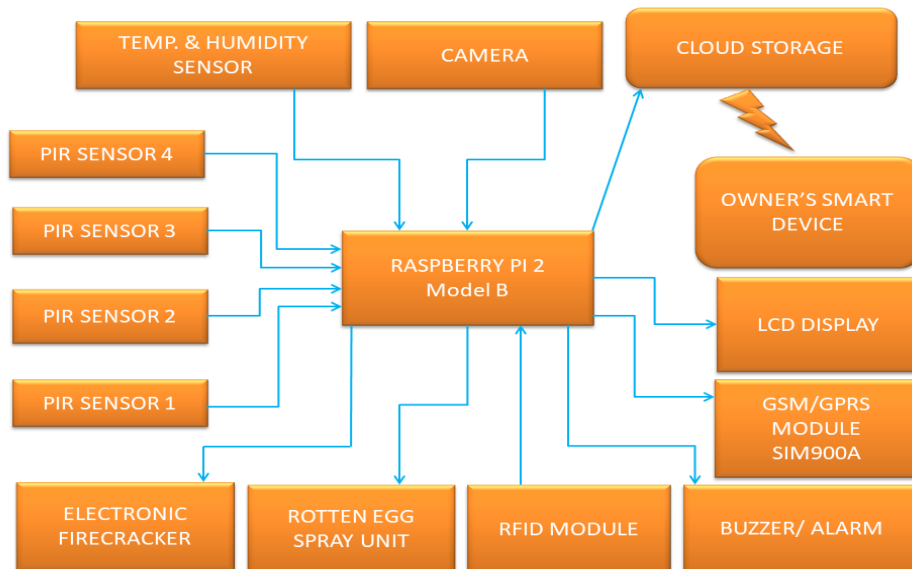

FIG.1. BLOCK DIAGRAM OF PROPOSED SYSTEM

sensors and camera are interfaced to the puppet. As soon as the PIR sensors go High on detecting motion within a range of 10 meters, the camera will be turned ON which first captures an image and then starts recording the video for about five to six minutes, which will be stored on board as well as cloud, simultaneously a message will be generated automatically to the registered number using a SIM900A module to inform about the intrusion along with the details of the temperature and humidity obtained by interfacing dht11 temperature and humidity sensor. If the motion detection is due to an authorized person with a valid RFID, who is mostly a farm worker, his attendance gets recorded automatically. Whereas if the motion detection is due to that of an unauthorized person without the valid RFID tag, the system further processes the image and video using Haar feature based Cascade Classifiers for object detection, and decides if the entity is an animal or human intruder.

We use Passive Infrared Sensors (PIR) to detect any motion of human body, once the employed PIR sensors detect motion the cameras capture an image and start recording the video as well as the owner of the farmland gets notified about the intrusion. This information along with the captured video is stored onto cloud from where the person in charge can access it once he receives the message. We use bash scripting for uploading the video to Dropbox. We also use RFID tags to differentiate between the authorized person and the intruders; if the person is an authorized one then no action is taken by the system. Whereas if the person is an unauthorized one the alarm or buzzer is turned ON to notify other people about the intrusion. Before which the system determines if the unauthorized person is an animal or human intruder based on Haar feature based cascade classifiers. If found to be an animal, the system then checks for the number of PIR sensors that have gone HIGH, if fewer number of sensors are high it denotes a smaller animal and all or more than half the sensors that turn high denoted it is a bigger animal and hence necessary action is employed to keep them away from destroying the crops. In order to automate the animal ward off system discussed, we take a decision based on the number of sensors that have gone high. The basic working principle is, if fewer numbers of sensors are able to detect the motion then it denotes an animal smaller in height such as a wild boar, deer etc., and we immediately turn on the rotten egg spray unit, which helps to keep away the pigs. Similarly if more than half or all of the employed PIR sensors have gone high it is naturally because of a huge animal such as the elephant which is another major threat to such farmlands, we initiate the electronic firecrackers to turn ON, the loud noise which in turn helps to ward off the bigger animals.

7. MERITS AND FEATURES

This system is very effective and carries following features and merits in comparison to the other solutions that exist in the current time.

1. *Effective, accurate and adaptive:-*

This system is very effective in driving off the animals from the fields and keeping them away. It accurately determines the presence of animals in the fields and sounds the buzzer. It does not sound the buzzer due to the presence of a human being or due to some random motion. The ultrasonic buzzer is very effective against animals and causes no noise pollution.

2. *Requires no human supervision:-*

This system requires almost no human supervision, except for the task of switching the system on and off. The system is capable of turning the buzzers on automatically and warding off the animals thus protecting the fields from any damage.

3. *Economical:-*

This system is economical as compared to many of the existing solutions like electric fences, brick walls and manual supervision of the fields. Thus it saves a lot of money of the farmer.

4. *Real time monitoring:-*

This system works in real time to detect the animals in the fields. The system enables the farmer to have a real time view of his fields from any place via internet and even provides manual buzzer controls if the need arises to use them. Thus the farmer is in effective control of the system and can manually sound the buzzer if needed.

5. *Causes no harm to animals and humans:-*

This system is totally harmless and doesn't injure animals in any way. It also doesn't cause any harm to humans. Also this system has a very low power requirement thus reducing the hazards of electric shocks.

8. FUTURE SCOPE

1. In addition to providing protection this system distinguishes between an intruder and an authorized person using RFID's.

2. We use Haar feature based cascade classifiers for object detection to distinguish between the animal and human.

3. When such intrusions occur the cameras employed are turned ON which capture an image and start recording the video for some time which will be stored on the SD card as well as stored on cloud i.e. dropbox, the land owner can then view the video on any smart device.

4. If the motion detection is due to an authorized person with a valid RFID, who is mostly a farm worker, his attendance gets recorded automatically.

5. We can design a IOT based application to provide an image and video feed to farmer on any smart device and farmer will be notified when there is an intrusion in the farm by animal along with additional information of humidity and temperature

9. CONCLUSIONS

The problem of crop vandalization by wild animals has become a major social problem in the 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 a smart embedded farmland protection and surveillance based system which is low cost, and also consumes less energy. The main aim is to prevent the loss of crops and to protect the area from intruders and wild animals which pose a major threat to the agricultural areas. Such a system will be helpful to the farmers in protecting their orchards and fields and save them from significant financial losses and also saves them from unproductive efforts that they endure for the protection of their fields. This system will also help them in achieving better crop yields thus leading to their economic wellbeing.

10. ACKNOWLEDGEMENT

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