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Smart System is Designed to Surveillance: The Crop Field Safeguard System from Animals

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Abstract
Animals like wild boars, buffaloes, cows, elephant, monkeys, birds, etc. damages the crop a lot which results in loss of production and so of farmer. It is very difficult for a farmer to keep an eye on the field every time. This system is designed to surveillance the field 24*7 which is not possible for a human being and diverts the animals without harming them. The system uses raspberry pi, PIR sensor to detect animal, camera module to look on animal, GSM module to send alert message to farmer, and a buzzer to divert the animals. This system ensures the safety of farm and decreases the loss of farmers.

Keywords: Raspberry pi, PIR sensor, Crop Protection

1. Introduction
Agriculture is the primary source of livelihood for about 58% of India's population. Agriculture is an important sector of Indian economy and it contributes about 17% to the GDP. Agriculture also provides employment to 60% of population. But due to various climatic changes and animal intervention the farmers are facing major losses. There are many traditional methods that are being used by the farmers like scarecrows, electric fences, etc, In some areas farmers uses smoke to prevent their farmland, the burn elephant dung or other materials that create heavy smoke. In some areas people also uses fish or garlic natural emulsion, castor oil to repels the animals. But these are not very effective to save the farms from animals. Hence, we have designed this affordable system to surveillance and to protect the farm effectively.

2. Literature Survey
Proposed a system for preventing agricultural land from animal and automated irrigation system. By using arduino, GSM module, IR sensor and soil moisture sensor, senses the environmental data and send to arduino. This system makes the use of IR sensor for detection of animals and soil moisture sensor to find the moisture of soil and automatically control the water pump for auto irrigation system. But this system does not utilize advanced technologies for alerting the farmer and detection of animals in farm. Proposed automated crop field surveillance using computer vision. In this system the long range camera are placed at the corner of field or land with considering maximum field of view of camera. When animal is detected by the camera the distance between camera and speaker is calculated. The speaker nearest to the animal is identified. The object detection is carried out by pre-trained model YOLO V3 and COCO dataset. If animal is detected the speaker nearest to the animal makes sound. But this system doesn't work in different circumstances like in the night or dark (shadow). proposed a system for crop protection from insects, pests, locusts, small animals and automatic irrigation system by sensing moisture, humidity and temperature of soil. The crop protection is done on the basis of sound technology and movement detection using ultrasonic sensor. The main advantage of this system is this system works in different circumstances like in night and dark (shadow). proposed a smart crop protection system from animals using Arduino UNO. The system is consisting of IR sensor for animal detection, ultrasonic sensor which rotates 360 degrees for detection of birds and a GSM module to send alert message to the farmer. It is a very simple system and cannot differentiate between human and animals.

This paper's motive is to design IOT based system to prevent animal intrusion in the crop field and providing weather conditions. Every year in Italy animal intrusion causes huge loss. The current systems for prevention of animal

intrusion are cruel and large amount of installation and maintenance cost is required. This system is based on an ultrasounds generator, which is not harmful for anyone in any way. Repelling system consists of a low power state-of-the-art Cortex ARM M0+ microprocessor which handles frequency production and the networking operations. Passive Infrared Sensor (PIR) sensor generates signal only when an animal is detected. Device can be tuned according to the animal that is desired to be repelled. Open source operating system called RIOT is used as it has features such as multi-threading, efficient network stack and memory allocation which are compatible for Real-Time use. One thread is used for the detection using a PIR and transmitting a multicast message to the gateway and the nodes. Another thread is used for receiving multicast messages from other nodes. Since our devices are producing data in real time, a Time-Series Database ' Open TSDB' is selected and a column family database 'HBase' as a long period storage. Weather monitoring system includes the device and the back-end. The device is a solar powered ESP-8266 Ardunio based board connected to various sensors. it communicates over Wi-Fi to the back-end system. It provides a real-time weather conditions via email notification. Main goal is to provide repelling and monitoring system.

The purpose of this system is to build a system to detect movement of animal and produce sound. Camera and microcontroller are used to detect the animal. System consists of Arduino, camera, GSM and buzzer. Movement detected by camera module after detection of movement system produce sound to divert animals and by GSM model SMS is generated by the system to alert the owner. This system provides an early warning about possible intrusion and damage by animal. This system is not harmful for anyone in anyway. A camera is basic requirement for this project. The camera module is set in a location where the animals enter into the farm. Prohibit the entry of the animal and give alert to owner of the farm.

The main problem of crop vandalization by wild animal tried to solve in this project. This system provides urgent attention and effective solution. System designed a smart embedded farmland protection which is low cost and also consumes less energy. Such system will be helpful to the farmer in protecting their field and save them from significant losses. This system help in achieving better crop yields thus leading to their economic well being.

3. Proposed System

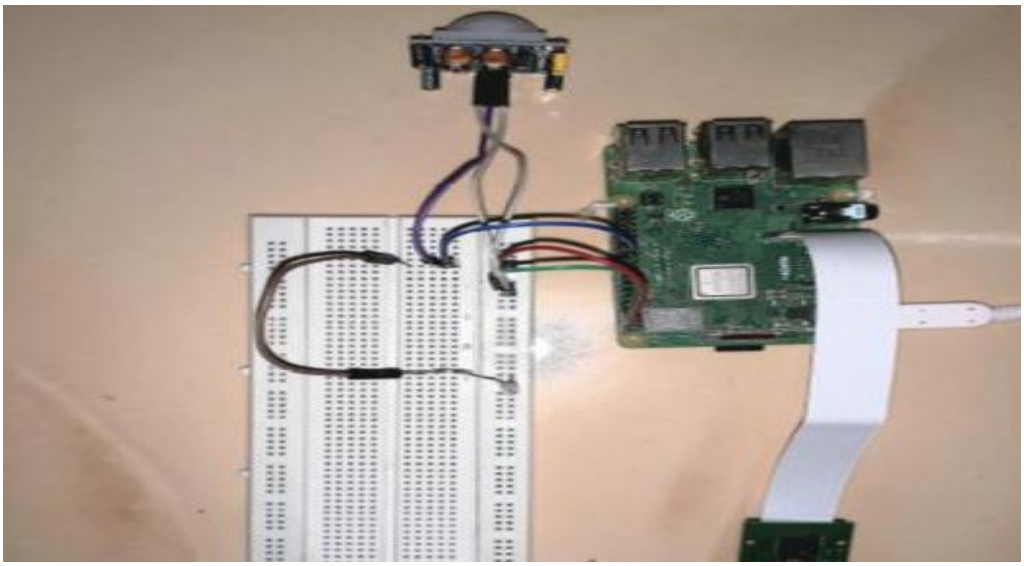
In this we have used raspberry pi which is main heart of the system. This project is helpful for the farmers and because of this system farmers are not required to stay on field 24 hours and guard it. We have used PIR sensor for motion detection. After processing if motion is detected, camera will be automatically turned on and command will be sent to capture the image. Captured image will be processed with the help of Open CV to check if the motion was due to animal interference or human interference. If it is due to animal interference, sound will be produced by buzzer to scare away that animal, and an alert email containing that image will be sent to the farmer. Flashlight will be used during the night time to capture better image and to simulate the presence of human during the night time. If the motion detection is due to human being then the system continues to sense the motion.

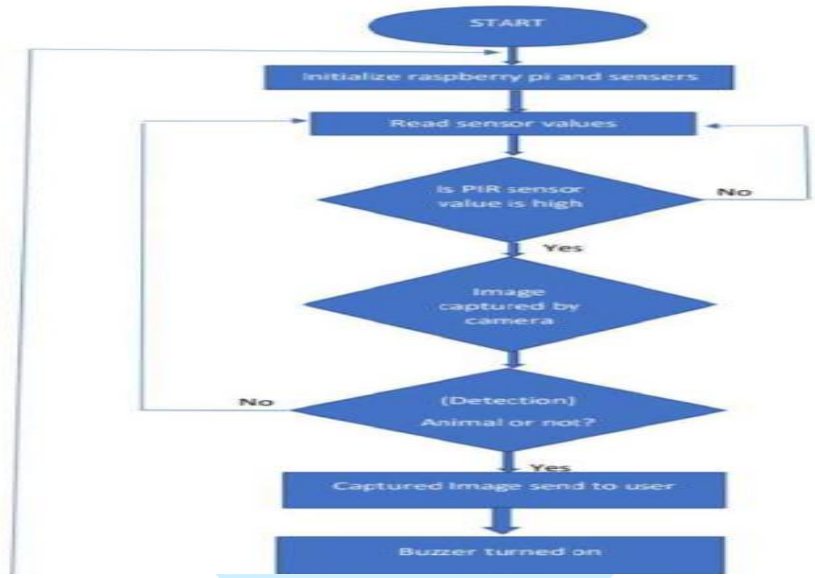
4. Hardware Specifications

1. Raspberry pi 3 B+•Broadcom BCM2837B0, Cortex (ARMv8) 64-bit SoC @ 1.4GHz •1GB LPDDR2 SDRAM •Extended 40-pin GPIO header •Full-size HDMI •CSI camera port for connecting a Raspberry Pi camera •Micro SD
2. Port for loading your operating system and storing data •5V/2.5A DC power input •Power-over-Ethernet (PoE) support (requires separate PoE HAT)
3. Big Dome PIR Motion Detector Module •Supply Voltage DC 5V•Quiescent Current: 65uA •Level output: High 3.3 V /Low 0V •Operation Temp: -15-+70 degrees •Using pyroelectric PIR sensor, Fresnel •3-5 m sensing range •110 degree angle sensor
4. 5MP Raspberry Pi 3 Model B Camera •Resolution: 5 MP •Interface Type: CSI(Camera Serial Interface) •Supported Video Formats: 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video
5. Buzzer(5)FlashlightIV. MethodologyDeveloping a Smart Crop Protection System from Animals, some steps need to be followed to achieve this successful task.

The steps are definable as follows:•Motion detection •Image capturing •Image processing •Alert generation Flowchart of the proposed systemSoftware development of the systemis done using Python. Whenever motion is detected, program will capture the image using Raspberrypi Camera. Image captured by the camera will be processed todifferentiate between Human and Animal OpenCV library is used along with COCO dataset. OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. The MS COCO dataset is a large detection, segmentation, and captioning dataset published by Microsoft.

Understanding visual scenes is a primary goalof computer vision; it involves recognizing what objects are present, localizing the objects in 2D and 3D, determining the object's attributes, and characterizing the relationship between objects. Therefore, algorithms for object detection and object classification can be trained using the COCO dataset. If the captured image is of Animal then buzzer will be turned on in the farm to scare the animals and an alert email will be sent to the farmer along with the captured image for the verification. If Human presence is detected then the program will continue to detect the motion.





5. Conclusion

In India many times farmers face huge loss just because of animals. Hence, to overcome this issue, the designed system produces the sound to scare the animals, so that animals will automatically ran away. The main aim is to prevent the loss of crops and to protect the area from intruders and wild animals which poses a major threat to the agriculture areas. The GSM module is used to make a call to the farmer to alert him. Therefore, the designed system is affordable and useful to the farmers. The designed system won't be harmful to animals and persons and it protects the farm areas. The system is capableto protect the farm in day and night with IOT monitoring

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