Strategies for minimizing the impact of wildlife on crop yields: An integrative perspective

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***Abstract* - India is an agricultural economy. Traditionally, India's dominant economic sector has always been agriculture. Despite the fact that agriculture employs the majority of India's population, farmers The main objective of our project is to divert the animal without threatening its life in order to protect the crop and boost economic yield. Since it might be challenging to manually monitor an expanded agricultural field, the technology was created to help farmers by minimizing crop damage. High-intensity electric fences are frequently employed to protect crops, but they harm animals. The camera will record the animal nearing the field from any direction. The animal will be spotted using image processing, and a sudden buzzer and odor will be generated. Through the medium of GSM, the farm owners and the local forest officer will be notified of the animal's detection.**

Keyword :Animal Mitigation, sound and smell transmitter, eco friendly

I. INTRODUCTION

India is a country of farmer.Human-animal conflict is a serious problem that endangers human lives and consumes a lot of resources. These arguments have been occurring more frequently nowadays. This region needs to be continuously watched to prevent the arrival of these animals or any other unwanted intrusion. People relocate into forests to make an existence urban areas grow due to increased industrialization, and animals travel into neighbouring villages in summer to find water and food. Elephants destroy the flora on farms that need healthy nourishment. Human-elephant conflict is more common in South Asia. Electrical fences are usually used to secure farmlands, any animals seeking to enter the field are electrified to severe agony, which makes the animals behave abnormally and sometimes even kills elephants.

Using IoT technology, this project seeks to safeguard elephants and crops. The system is made up of a number of parts, such as Camera, Buzzer, Raspberry Pi , odour dispenser and GSM module for notifying farmers through Android devices that provides real-time notifications.

II. RELATED WORKS

Despite advancements in technology, traditional methods like as scarecrows are still employed to keep animals from damaging crops. The Agriculture Intrusion Detection System is described in this paper[1].

IoT is crucial in this case, as we utilize Raspberry Pi to identify animals and notify cars. With the use of image detection, the Raspberry Pi camera is set up to record live photos and animal movements, then notify people and cars on the forest roadways.[2]

A Raspberry Pi 3 microcomputer and an application that could identify faces and sense movements were combined to create a complicated system. The monitoring system can be placed anywhere and, with a battery and solar panel, can be operated independently as intended.[3]

A systematic approach that incorporates both traditional farming methods and the use of the "Internet of Things." Therefore, the purpose of this proposed module is to make agriculture smarter by suggesting a device that uses an ultrasonic sensor or a PIR sensor for detecting the presence of any living being, particularly animals, near the land that will be used for cultivation.[4]

By making noise and smell generated sending out a signal, it diverts the animal. This signal is then sent to GSM, which promptly notifies the forest authorities and farmers. [5]

The natural components used to make the scenty elephant repellent are boiled together, allowed to develop, and then strained to create a strong, pungent odor. The components (chilli, garlic, ginger, cooking oil, eggs, neem leaves, and dung) were either gathered locally or bought from neighboring towns. They were then pummelled before being cooked together and allowed to mature for around four weeks in sealed containers.[6]

Experiment findings showed that both the noise produced by a drone and the growls of tigers can significantly deters elephants. The sounds of bees, along with low-frequency bursts, produced comparable effects regarding elephant's reactions to encounters and their subsequent withdrawals. . [7]

Tested a new olfactory deterrent on 40 farms in Kenya and Uganda called "smelly elephant repellent," which is an unpleasant-smelling organic liquid. According to our findings, the repellant successfully prevented elephants from stealing crops. In Uganda, 309 elephant crop raids were prevented in 82% of cases during the research period. The repellant significantly impacted test locations when compared to control sites, and it prevented 63% of 24 crop raiding instances in Kenya.[8]

III. MATERIALS AND METHODOLOGY

Hardware components

- Rapberry pi
- Camera
- Buzzer
- GSM Module
- Odour Dispenser
- Solar Panel
- Lead acid battery

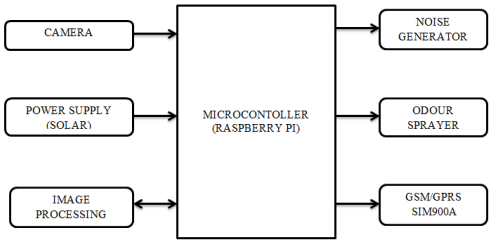

Fig1 : Block Diagram

A Convolution Neural Network (CNN) is used by a system to identify and classify animals in real time. We utilize a Python-based application with a few inputs to identify and classify the animal in a video that is sent to the Raspberry Pi. We have also integrated software that uses the YOLO V3 algorithm to remotely inform the user of the animal's type. This allows us to provide the user with both the animal's name and identification.
Wireless photo and video recording is therefore very crucial in ecology. Four data gathering systems are commonly employed for picture acquisition: satellites, drones, camera traps, and video loggers. The usage of these technologies in research involving basic image processing is explained in this section. The proposed system integrates the OpenCV module, camera, and speaker to achieve effective surveillance. The You Only Look Once (YOLO) object detection system uses the single shot detection technique to quickly identify animals and trespassers entering agricultural areas. Farmers receive an SMS notification via the GSM module.

The camera in the system begins by recognizing an object. As soon as an object is spotted, the system notifies the rasberry pi. This notification is intended to alert the farm owner of the incursion. After receiving the notification, the farm owner can react suitably. The flowchart illustrates the two possible actions of creating noise and releasing odor. When the chosen action is executed, the system terminates. This flowchart shows how the camera responds to the intrusion warning by detecting items, alerting the farmer, making noise, and releasing odor.

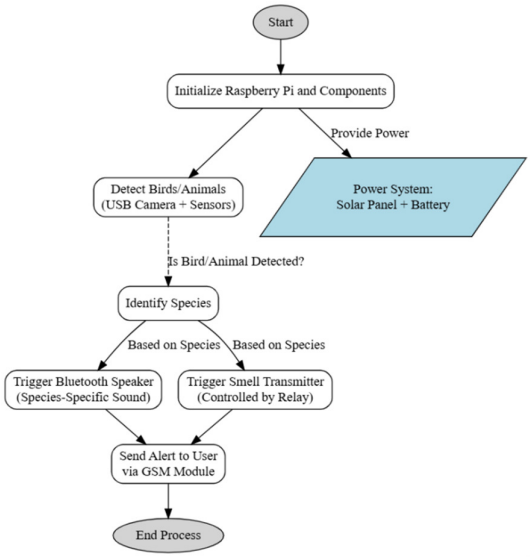

Fig 2: Process flow

IV. RESULT AND DISCUSSION

Thedesigned kit is mounted in the pole and place in the agricultural field.When an intrusion is detected, the camera it triggers the Raspberry Pi The camera captures an image of the intruder, and a notification is sent to the farmer through GSM .When an elephant approaches, the buzzer sounds an alarm to redirect it. If the elephant does not move, the odour dispenser releases an odour that the elephant dislikes.

Fig 3 :Designed system placed in the field

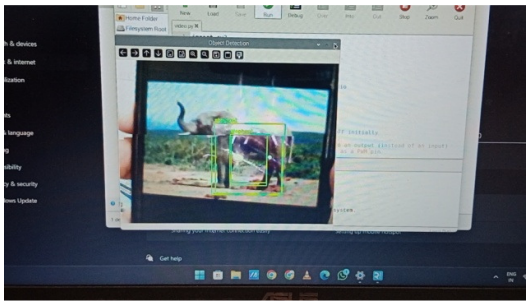

Fig 4 :Some animal intruding the field and image detected [1]

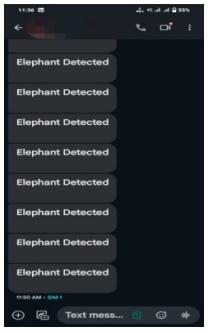

Fig 5 :Notification send to the farmer

V. CONCLUSION :

An inventive, environmentally friendly, and compassionate way to reduce wildlife intrusion in sensitive areas and agricultural fields is the Animal Mitigation System. The technology successfully deters animals without endangering them or the environment by integrating species-specific sound signals with smell transmitters. It is a dependable option for remote and off-grid areas because of its integration with solar energy, which guarantees continuous operation. The effectiveness is increased by adding a GSM module, which gives users real-time warnings. This project promotes a peaceful coexistence between human activity and the natural ecosystem in addition to addressing the financial losses brought on by wildlife invasions. The system's eco-friendly design and low maintenance requirements make it both affordable and scalable.

VI. FUTURE SCOPE :

Expanding the use of artificial intelligence (AI)and machine learning (ML) can enable the system to identify specific species and adapt deterrent signals dynamically, enhancing effectiveness.Incorporating IoT technology for cloud-based monitoring and data analysis could provide users with valuable insights into wildlife patterns and behavior over time.Further, the system could be adapted for use in wildlife corridors, highways, and airports, where animal intrusions pose safety risks.

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