INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Automatic Farm Protection

Jaseem Muhammed V[1], Sashika P[2], Muhammed Rabeegu[3], Niranjana M[4], Ramjith T P[5], Junaid K V[6], Namrutha U[7]

[1, 2, 3, 4, 5]Institute of Engineering and Technology Calicut University, Kerala, India

[6, 7]Assistant Professor Higher Grade, Institute of Engineering and Technology Calicut University, Kerala, India

Abstract: Animal-induced crop damage in India is a major concern, causing reduced agricultural output. Conventional farming methods are insufficient, and guards are impractical. To address this, a machine learning project is proposed, utilizing deep neural networks to detect animals entering farms. The project uses cameras to monitor the farm, identifying instances of animal intrusion and using sound cues to deter them.

Keywords: Convolutional Neural Network, Deep learning, Prediction, Training and Validation, Play Sound.

I. INTRODUCTION

For over 58% of Indians, agriculture is their main source of income. A significant portion of the Indian economy—roughly 17% of the GDP—comes from agriculture. Additionally, 60% of people work in agriculture. However, the farmers are suffering significant losses as a result of numerous climate changes and animal interference. Farmers employ a variety of conventional techniques, such as electric fences and scarecrows. In certain regions, farmers utilize smoke to keep their crops from burning, burning elephant dung, or burning other items that produce a lot of smoke. In certain regions, people also employ castor oil, fish, or garlic natural emulsion as animal repellents. However, devices don't do much to keep animals off of farms. As a result, we created this reasonably priced solution to efficiently monitor and safeguard the farm. Human existence is exclusively reliant on the agricultural industry. This enormous industry drives the advancement of both technology and intellect in our race. Since people began engaging in agricultural activities about 10,000 years ago, it has become imperative to preserve as much of the time and energy expended on growing food and making textiles as feasible. The ever-growing population and the ensuing exponential rise in demand serve to further solidify this necessity. Conflicts between humans and animals are increasing as a result of habitat loss and natural resource depletion brought on by urbanization, industrialization, poaching, and encroachment. This has led to a decrease in crop productivity as a result of animal assaults.

II. LITERATURE REVIEW

This project helps farmers by removing the requirement for ongoing field surveillance by using a Raspberry Pi as its key component. It has a PIR sensor built into it that detects motion and causes the camera to start taking pictures. To analyze the photos and distinguish between interference from humans and animals, OpenCV is employed. If animals are found, a buzzer is set off to frighten them away, and the farmer receives an alert email containing the picture that was taken. In order to imitate human presence and enhance image quality at night, a flashlight is also used. The system offers an inexpensive, safe answer to the issue of crop damage brought on by animals and trespassers, and it can monitor fields through the use of Internet of Things technology[1].

This paper proposes a method to protect farms from wild animal intrusions using a combination of traditional methods and ubiquitous wired network devices. Operational microcontroller amplifier circuits are used for animal detection, providing early warnings about possible intrusion and damage. The development of an Internet of Things (IoT) application for crop protection is presented, including a repelling and monitoring system to prevent potential damages in agriculture. The deployment of IoT in the agriculture sector has led to smart farming and precision agriculture. The proposed system includes an IoT model with a, LDR for image capture, and a server for image storage and deletion. Based on the number of animals detected, functions such as light or irritating sounds are executed to repel the animals, and the farmer receives a notification about the intrusion. This integrative approach aims to prevent crop losses, protect the area from intruders, and address the social problem of crop protection by wild animals, leading to better crop yields and economic well-being for farmers[2].

Surveillance plays a crucial role in various sectors, including homes, hospitals, schools, public places, and farmlands. It helps monitor areas, prevent theft, and provide evidence. However, when it comes to farmlands, the focus is often on human intruders, neglecting the significant damage caused by animals. Animal attacks on crops result in poor yields and financial losses, sometimes leading farmers to abandon their lands. To address this problem, a proposed system utilizes a Raspberry Pi board as the core, with sensors and cameras interfaced to it. When motion is detected within a range of 10 meters by Passive Infrared Sensors (PIR), the system captures images and records videos for a few minutes, which are stored on-board and in the cloud.

Simultaneously, an automatic message is sent to the registered number using a SIM900A module, informing about the intrusion and providing temperature and humidity details from a DHT11 sensor. If the motion is caused by an authorized person with a valid RFID tag, their attendance is recorded. However, if an unauthorized person without a valid RFID tag triggers the motion detection, the system employs Haar feature-based cascade classifiers to determine whether it is an animal or human intruder. The captured video and information are stored in the cloud for access by the responsible person. The system utilizes RFID tags to differentiate between authorized individuals and intruders, activating an alarm or buzzer for unauthorized persons. If the unauthorized entity is determined to be an animal, the system checks the number of PIR sensors triggered to differentiate between smaller and larger animals. Various actions are taken to deter animals, such as activating a rotten egg spray unit for smaller animals like wild boars and deploying electronic firecrackers for larger animals like elephants. This automated farmland protection and surveillance system aims to address the social problem of crop vandalization by wild animals, providing a low-cost and energy-efficient solution. By safeguarding crops and deterring intruders and wild animals, this system helps farmers avoid financial losses and unproductive efforts, ultimately leading to better crop yields and economic well-being[3]

This paper proposes an advanced communication system for smart irrigation and crop protection against animal intrusions in farms. The system utilizes PIR sensors to detect animal movements and trigger alarms. Additionally, soil moisture sensors are employed to automatically activate water pumps when the soil becomes wet. To prevent excessive water usage, a rain sensor is incorporated, which opens the canal when heavy rainfall is detected. Furthermore, a gas sensor is utilized to detect fires in the farm. The system aims to conserve resources, particularly water, and enhance crop growth while minimizing the need for constant human supervision. It also addresses the issue of crop damage caused by animals and fire, offering a potential solution to protect farmers' fields and reduce financial losses. By incorporating remote communication capabilities, the system enables owners to monitor and control an electrified barrier, ensuring its effectiveness and safety from remote locations. Overall, this project has significant social importance, contributing to the sustainability and prosperity of agricultural production.[4]

This paper addresses the critical role of agriculture in the Indian economy and emphasizes the need for enhanced security measures to protect farmers and their farmlands. Traditional methods like scarecrows are still prevalent, but they have limitations. The proposed solution is an Arduino Uno-based framework employing a PIR sensor for intruder detection, a smoke sensor to identify fire-related threats, and a soil moisture sensor for monitoring water content in the soil. The system aims to provide comprehensive security by activating an alert, including a buzzer and SMS notification to the owner, upon detecting intruders or smoke. This adaptable system enhances crop monitoring and equips farmers with valuable information about soil conditions, contributing to the overall safety of agricultural fields.[5]

In agriculture, the persistent challenge of wild animal damage prompts the need for innovative solutions. To address this age-old conflict, a sustainable technological system is proposed in this paper. Given the continuous strides in technological advancements, a widespread implementation of such solutions becomes crucial for future sustainability. In Stage 1, four junction boxes are positioned at the field's corners, with one serving as the coordinator and the others as routers. These boxes employ a laser-triggered system using LDR detectors. When triggered, the LDR value drops below a pre-set threshold. In stage 2 activates the communication system, utilizing X Bee modules in each box with SSL protocol. Once triggered, a message is relayed to enable the light system on all poles. In stage 3 involves the coordinator junction box, featuring GSM technology for digitizing and compressing data. It sends an alert to the field owner, including the triggered system count, once the entire system is engaged each junction box (JN BOX) contains Arduino Uno, a laser transmitter, X Bee module, and LDR. One box includes RTC and GSM. Laser and LDR components align in a line of sight across boxes. Figure 4 displays the experimental setup with a closer view showcasing the junction boxes and lasers [6]

III.   METHODOLAGY

Anaconda software, TensorFlow, OpenCV, Twilio, Pi Game libraries, and Google Teachable Machine are combined to create an automatic farm protection system. This approach uses machine learning algorithms to detect and respond to threats, using deep learning models for deep learning, OpenCV for image processing, Twilio for notifications, Pi Game for interfacing with hardware, and Google Teachable Machine for custom model training. Anaconda software manages Python packages and dependencies, while TensorFlow is an open-source framework for object detection, OpenCV for computer vision tasks, Twilio for farm protection, and Pi Game for game development and hardware interfacing. Google Teachable Machine is a web-based tool for training custom machine learning models without writing code, providing enhanced security and peace of mind for farm owners.
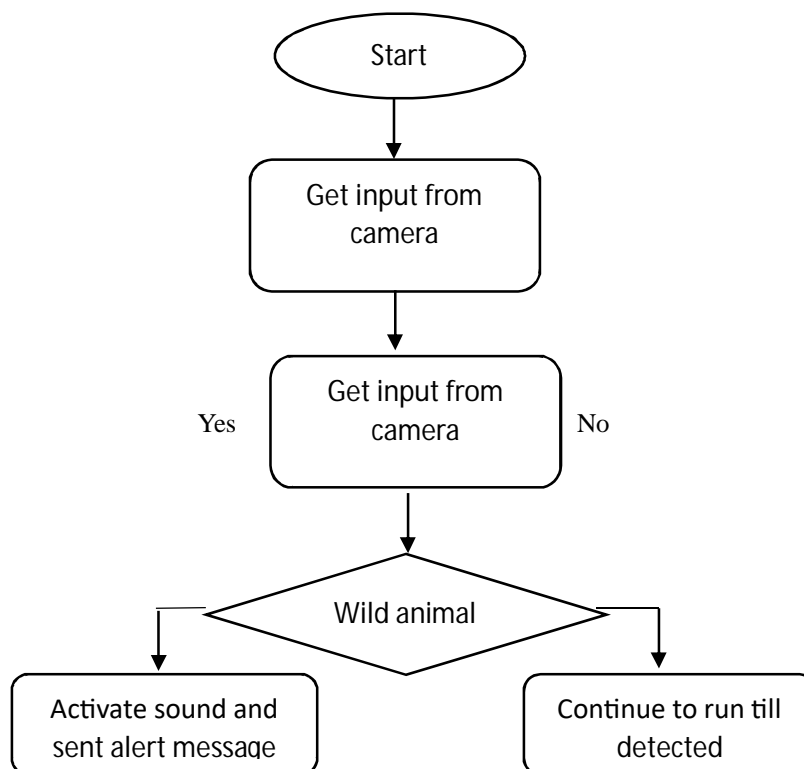
IV. SYSTEM DESIGN

Figure 1; Flow chart

Step 1: Start

Step 2: Run the code

Step 3: Get the input from camera

Step 4: Check if any animal is detected

Step 5: If yes, activate sound and send message to the owner through Twilio website

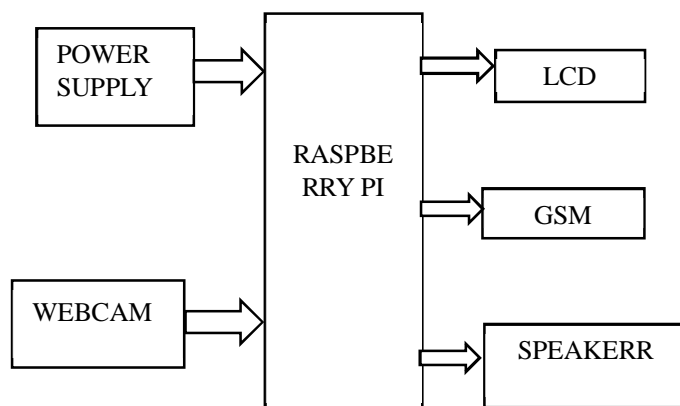Step 6: If no, continue to run till it detect an animal

Figure 2: Block diagram

The primary objective of the "Smart farm protection and intruder alerting system using machine learning" model that has been put forth is to establish an automated system for agricultural field monitoring. Connected to the Raspberry Pi are the webcam, buzzer, LCD, and GSM. The OPEN CV data set program code is used by the Raspberry Pi to control all operations, with modifications made based on the specific requirements.

The webcam is always keeping an eye on the crop field during the animal intrusion and is taking photographs every single second. These images are sent to the Raspberry Pi for machine learning concept image processing. We will compare the trained image with the camera image. The trained images came from a variety of sources, including RMFD datasets and Kaggle. The 360-degree rotation reference images are of animals arranged and shaped differently. The board is trained with these images. Based on pictures and real-time video broadcasts, the model was deduced. We analyzed criteria such as accuracy, precision, and recall to choose a base model, and the machine learning model with the best performance100% precision and 99% recall was chosen. Additionally, it utilizes machine learning to be computationally efficient. Integrated into the Raspberry Pi, making it simpler to Set up the model on embedded platforms. When the comparison data matches the taught data, an LCD display will show the detected animal (a panda or elephant) and a buzzer will ring to reroute the animal. Additionally, information is communicated to farmers and forest officers via GSM. Typically, basic electrical components were employed; in this case, it is suggested to apply image processing and machine learning to both identify the animals and indicate their species (Pandas, Elephants) in the message bar.

V. RESULT AND DISCUSSION

1) If animals are detected during the live image or video captured by camera, a repelling sound is played in order to drive away the animal with the help of speakers.
2) The dataset has been configured for specific animals, which can be stored in the computer.
3) The code for the detection of animals along with the subsequent comparison process with dataset is currently in progress

Figure 3: final output

VI. ADVANTAGES AND DISADVANTAGES

A. *Advantage*
1) Early detection of instructions
2) Animal safety
3) Minimised losses
4) Enhanced security
5) Remote monitoring
6) Data collection

B. *Disadvantage*
1) Technical challenges
2) Limited coverage
3) Bad network connectivity can slow down the process

VII. APPLICATION

1) Farmlands
2) Crop protection
3) Intruder detection
4) Surveillance
5) Smart fencing

VIII. CONCLUSION

The problem of crop vandalization by wild animals has become a major social problem in current time. In other words, while utilizing his/her crop production, every farmer should be aware and take into consideration the fact that animals are living beings and need to be protected from any potential suffering. It requires urgent attention and an effective solution. Thus, this project carries a great social relevance as it will help farmers in protecting their fields and save them from significant financial losses and will save them from the unproductive efforts that they endure for the protection of their fields.

REFERENCES

[1] International journal of research in advent technology (ijrat) special issue national conference "convergence 2018", 09th april 2018 vikas bavane , arti raut , swapnil sonune (UG student mechanical engineering department, pankaj laddhad institute of technology and management studies, buldana) Proposed a system for PROTECTION OF CROPS FROM WILD ANIMALS USING INTELLIGENT SURVEILLANCE SYSTEM

[2] 2021 7th international conference on advanced computing & communication systems (icaccs).Meeradevi.T, manoj kumar p(asst. Professor, kongu engg. College) proposed a system for SMART IRRIGATION AND CROP PROTECTIO USING ARDUINO

[3] 2021 JETIR July, volume 8, issue 7 Dr.Rajendra Gode Institute Of Technology and Research Amravati, 1.Ms. Netra V. Deshmukh,.2Dr. Ravindra M. Deshmukh,3.Prof. Praveen Likhitkar proposed a system from SMART CROP PROTECTION SYSTEM AGAINST WILD ANIMALS USING IOT

[4] International journal of creative research thoughts (IJCRT), Finolex Academy of Management and Technology,Ratnagiri, India, Department of electronics and telecommunication engineering, 1.Mr. Jayesh Redij, 2.Mr. Pranav Shitap, 3.Mr. Shikhar Singh, 4.Mr. Durvesh Zagade, 5.Dr. Sharada Chougule. Proposed a system for SMART CROP PROTECTION SYSTEM FROM ANIMALS.

[5] International Advanced Research Journal in Science, Engineering and Technology (IARJSET) Vol. 8, Issue 7, July 2021 KS INSTITUTE OF TECHNOLOGY BANGALORE, 1.Varshini B.M 2.Sushama A.V,Proposed a system for SMART CROP PROTECTION USING ARDUINO

[6] 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science, Amritaviswa Vidyapeetham, amritapuri, 1.rajeshKannan,2.gautham p krishna,3.sreejiyh s pai proposed a system for IMPLIMENTATION OF JUNCTION BOXES FOR PREVENTING ANIMAL ATTACKS IN FAMS AUTHOR'S PROFILES

AUTHOR'S PROFILES

Jaseem Muhammed V is currently doing B.Tech (ECE) from The Institute of Engineering and Technology, Calicut University, Kerala, India.

Sashika P is currently doing B.Tech (ECE) from The Institute of Engineering and Technology, Calicut University, Kerala, India.

Muhammed Rabeegu is currently doing B.Tech (ECE) from The Institute of Engineering and Technology, Calicut University, Kerala, India.

Niranjana M is currently doing B.Tech (ECE) from The Institute of Engineering and Technology, Calicut University, Kerala, India.

Ramjith T P is currently doing B.Tech (ECE) from The Institute of Engineering and Technology, Calicut University, Kerala, India

Namrutha U Assistant Professor (Higher Grade), ECE department, Institute of Engineering and Technology, Calicut University, Kerala, India.

Junaid VK Assistant Professor in ECE department, Institute of Engineering and Technology, Calicut University, Kerala, India

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 ⊙ (24*7 Support on Whatsapp)