IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.047 ⁜ Vol. 10, Issue 7, July 2022

DOI: 10.17148/IJIREEICE.2022.10702

Development of Wild Animal Ward-Off System

Shivaramu H T[1], Mohammed Yaseen[2], Loyal Aaron Noronha[3], Mahammed Javid[4], Rithvik S Shetty[5], Chinmay N Naik[6]

[1-5]Dept. of Mechanical Engineering, Mangalore Institute of Technology & Engineering, Moodabidri, D.K - 574225, Affiliated to V T U Belagavi, Karnataka, India

[6]Production Engineer (MOE21-Body Electronics), Bosch (RBAI), Nagananthapura, Electronic City, Bangalore -56010, Karnataka, India

Abstract: Farmers suffer losses as a result of crop damage caused by animals and birds during the stages of sowing, seeding, ripening, and harvesting. Traditional methods of controlling bird and animal attacks, such as beating drums, screaming, lighting fireworks, and using reflective materials, are less effective when used on daytime attacks by birds and animals. Surveillance, as is well known, is widely used in a variety of settings, including homes, hospitals, schools, public spaces, farms, and so on. It allows us to keep an eye on a specific area, prevent theft, and provide proof of evidence. Monitoring is critical in the case of farmlands or agricultural grounds to both protect the environment and prevent unauthorized individuals from entering the region area from animals. Image processing techniques, night vision cameras, and IoT technologies will undoubtedly solve these problems. This system is capable of repelling animals from agricultural fields when they attempt to intrude; the system is outfitted with different triggering systems based on animal type. It has a loud noise generator for larger animals like elephants and a rotten egg sprayer for smaller animals like deer and boar. At first, these animal movements will be detected by passive infrared and microwave sensors, which will turn on the camera for image processing following successful animal detection. The primary goal of this work is to increase food production rates, prevent economic losses for farmers due to animal intrusions, and bring a smile to the farmer community.

Keywords: Crop Damage, Animal Attack, Crop protector, Ward-off.

I. INTRODUCTION

Agriculture is India's main source of income, accounting for 70% of total income. Despite the fact that agriculture employs the majority of Indians, farmers face a number of challenges. Crop destruction by wild animals is a serious issue that is getting worse in fields. Numerous animals, including deer, wild pigs, rabbits, moles, elephants, and monkeys, have the potential to cause significant crop damage. They can harm the plants by eating plant material or simply trampling them as they run through agriculture fields. As a result, it is critical to keep an eye on this area at all times in order to prevent animals or other types of unwanted entry. Encroachment and illegal hunting cause animal-human conflicts. As a result, wild animals have the potential to quickly result in significant yield losses and additional financial issues. Consider how crop security from wild animals necessitates extra precautions. In other words, every farmer should be aware that animals are living beings that must be protected from any potential suffering while being used in food production.

Traditional crop security techniques include fencing, scarecrows, and natural repellents such as smoke, rotten eggs, fish or garlic emulsion, castor oil, and so on. Electrical fencing has been discovered to be costly to install and ineffective for large animals, making it difficult for small farmers. The use of fences is frequently regulated. Scarecrows and other methods are ineffective as well. Once they've gotten used to it, the wild creatures won't be afraid of it. Electrical repellent techniques such as sonic and ultrasonic are used. However, farmers cannot afford them. Animals can be harmed by electric fences and animal traps. And the injured animal usually dies as a result of its injuries. These practices have done far more harm than good, taking the lives of both humans and animals.

The most pressing issue of human-animal conflict is addressed by the wild animal ward off the, which protects animals while alleviating farmer concerns. The crop protection and animal intrusion system aid in the development of a security system for farm defense and the prohibition of animal entry; the system uses an IoT module to notify the farmer. The system ensures that the alarm does not sound because there is a person in the area or because of any other random motion.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.047 ⁜ Vol. 10, Issue 7, July 2022

DOI: 10.17148/IJIREEICE.2022.10702

II. LITERATURE REVIEW

Surveillance is the main function of current systems. Additionally, these devices can not provide security against animals in the wild, particularly in this deployment zone. They also should react depending on the nature of the creature trying to cross the protected area, as various methodologies are utilised to keep different animals out of such areas. Growers also employ different methods, such as building human mimics on agricultural farms, which seem to be ineffective at repelling wild creatures but effective at repelling birds. Installation of barriers, the use of wire fences, personal surveillance, as well as other moment and risky techniques are all popular methods used by farmers to avoid agriculture depredation by wildlife. These preventative measures were formerly dangerous to wild animals.

Bavane et al. [1] proposed crop protection from wild animals system, which was embedded with smart surveillance. The current research focuses on animal repel mechanisms, which are used in croplands to keep wild animals from destroying crops. This method incorporates RFIDs to differentiate involving an intruder and a permitted person in addition to offering security. Different PIR sensors were placed throughout the space to discover any movement and, when movement is detected, a camera is turned on, enabling real-time monitoring. It entails the automation of various ways of preventing wild animals from invading farmland and ruining crops, as well as the usage of an electronic firecracker.

A security system was integrated into a pyroelectric IR sensor by Nahatkar et al. [2]. The main purpose of this work is to create an affordable surveillance system using a simple PIR sensor module and a microprocessor with very little alerting capacity. By observing the signal emitted by a PIR sensor, the system identifies the existence of individuals who are not in thermal balance with their environment. When it identifies the presence of any unauthorized individual in a specific area, it sounds an alarm and dials a definite number using a GPS module.

Datta et al. [3] explore how to use an autonomous surveillance and warning device to tackle the issues of wild animals wandering from national parks and wildlife sanctums causing animal and human injury and death. Using GSM and GPS technology, an electronic monitoring and alarm system has been developed in the form of a device that would be attached to an animal's body and would continuously monitor the animal's position concerning GPS-defined borders set up inside a wildlife sanctuary or national park. Even when an animal ventures outside the Navigation zone, an alarm is triggered in a sentient region, warning people of the impending danger.

Bird penetration is purportedly recognized by employing wearable sensors and noisemakers that generate acoustic noises, according to Maheswari et al. [4]. When detectors in the farming fields identify a bird, acoustic signals are produced. This noise has irritated the birds. As a consequence, the chicks will leave if these tones are produced because they are unwilling to adjust to the disturbance. As an outcome, farmland destruction by birds can really be averted. Whenever the chicks are recognized, these sonic sounds will be made and will last for a short period till the birds are chased away.

Munian et al. [5] designed an intelligence technique for monitoring wild creatures in an automotive application utilizing HOG and CNN. This research adds a novel intensity to wild animal auto-detection throughout dynamic midnight periods, utilizing infrared thermal interpretation via a camera car attachment to reduce automobile and wildlife collisions. Tushar et al. [6] explain how to discover wild animals on a farm using image processing and machine learning, which uses HOG technology to recognize the animal and capture video. The traditional techniques have not functioned effectively in the detection of wild animals, to conquer these and to obtain actual and efficient performance computer vision was implemented in the current system. The system was able to recognize the animal advancement toward the land accurately.

Rekha et al. [6], suggest an animal identification and tracking system. Animal identification and tracking have a variety of applications, including preventing harmful animals from entering residential areas, studying animal behavior, and so on. The approach is based on a human facial recognition method that employs Haar-like features, AdaBoost classifiers, or CNN. The information collected by the tracker can be utilized to increase the priors in the probabilistic semantic categorization of wildlife movies, allowing for the discovery of certain animal species.

The groundwork for constructing an advanced security program that utilizes IoT and image processing is built on database systems, sensor technologies, and Open CV modules. The domains of pattern matching and data analytics also have an impact on security equipment. Researchers have been creating various IoT-based security devices, however, there has been relatively little work documented concerning agricultural farmland security. Among the few works that have been reported, the following are some of the more notable works in the literature. A smart farm security system that uses image processing techniques and an alert mechanism to detect mobility in farms and capture the scene image using an Arduino microcontroller [7,8]. The image is not processed on the Arduino microcontroller for detection of malicious activities; as an alternative, the imprisoned image is sent to the server, where Matlab was established, and the developed results were sent to the Arduino. Triggering the sound generator to alert the farm owner is one of the outcomes. The process of delivering an image to a server is prolonged and unstable because there is no way to process images at the source. After all, the system lacks the necessary hardware [9].

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.047 ⁜ Vol. 10, Issue 7, July 2022

DOI: 10.17148/IJIREEICE.2022.10702

IoT technologies and sensors were used to develop new approaches. However, it was discovered that they were ineffective since their warding ability was restricted and they were not producing the desired outcomes. For farmers, the technique would be prohibitively expensive. Those techniques were also not used in practice due to picture classification issues. There was also inefficiency during adverse weather conditions. They are also required to be updated or maintained regularly.

III. METHODOLOGY

The system's operation is depicted in the block diagram Fig. 1. The system has PIR sensors installed throughout the field to detect movement. If it detects motion, it sends a signal to the Raspberry Pi, which activates the camera for image classification.

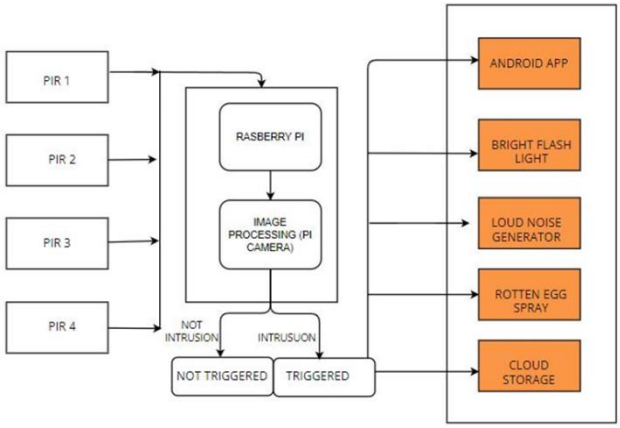

Fig. 1 Working Principle

If the detected object is an animal, the set of animal-specific triggers will be triggered. The proposed system makes use of a Raspberry Pi board as the system's main heart; the sensors and camera are attached to the system. As soon as the PIR sensors detect motion within a 10-metre range, the camera is turned on, which first captures an image and then begins recording the video for about five to six minutes, which is then stored in the cloud, and a message is sent to the farm owner, which can be done through an android app to notify them of the intrusion, and if the entity is human, my system does not trigger. The PIR sensor is used to detect any motion. When the PIR sensors detect motion, the cameras capture an image and video recording begins, and the owner is notified of the intrusion. GSM has been used to notify the farmer of any animal intrusions on his farm. This system provides farm surveillance 24 hours a day, seven days a week.

IV. CONCLUSION

The problem of agricultural vandalism caused by wild animals has become a major social issue in modern times, and the animals, many of which are already threatened or endangered, are occasionally killed in retribution or to avoid future conflicts. It necessitates a forceful solution from keenly interested parties. This assignment is extremely important to society because it seeks to address this issue. To address this issue created a system that could display the sphere using a digital camera. It can also be used to reduce animal accidents and reduce human-animal conflicts.

- The type of the animal intruder is identified by the image processing system with the signal received through the sensors and the camera.
- The triggering system successfully wards off the animals by triggering the loud noise generator, rotten egg spray, and flashlight based on the type of animal.
- The system will not trigger when the human, cow, or goat is identified as an intruder.
- The image is captured during the day, night, and in cloudy, foggy, and rainy weather and sent to the farm owner via the Android app.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.047 ⁜ Vol. 10, Issue 7, July 2022

DOI: 10.17148/IJIREEICE.2022.10702

ACKNOWLEDGMENT

We would like to express our gratitude to the Karnataka State Council for Science and Technology (KSCST), Karnataka for sponsoring the project work under the scheme of Student Project - 45th Series: Year 2021-2022 (Reference No.: 45S BE 131), as well as the Department of Mechanical Engineering and Management of Mangalore Institute of Technology & Engineering, Moodabidri, Karnataka for providing necessary facilities for the successful completion of Project work.

REFERENCES

[1] Bavane, V., Raut, A., Sonune, S., Bawane, A.P. and Jawandhiya, P.M., 2018. Protection of Crops from Wild Animals Using Intelligent Surveillance System. International Journal of Research in Advent Technology (IJRAT), pp. 2321-9637.

[2] Nahatkar, S., Gaur, A. and Pattewar, T.M., 2012. Design of a home embedded surveillance system with pyroelectric infrared sensor and ultra-low alert power. International Journal Of Advanced Research in Electronics and Communication Engineering, 50(3), pp. 86-90.

[3] Datta, N., Sarkar, S., Malik, A. and Punetha, D., 2016. Automatic tracking and alarm system for eradication of wild life injury and mortality. In 2016 2nd International Conference on Advances in Computing, Communication, & Automation (ICACCA), pp. 1-4.

[4] Maheswari, P.U. and Rajan, A.R., 2016. Animal intrusion detection system using wireless sensor networks. International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST), 2(10).

[5] Y. Munian, A. Martinez-Molina and M. Alamaniotis, "Intelligent System for Detection of Wild Animals Using HOG and CNN in Automobile Applications," 2020 11th International Conference on Information, Intelligence, Systems and Applications (IISA, 2020, pp. 1-8, DOI: 10.1109/IISA50023.2020.9284365.

[6] Tushar Atkare, Snehal Khalkar, Pallavi Mandekar, Ganesh Kolhe, Anita Gawali, Wild Animal Detection in Farm using Image Processing and Machine Learning, IJARCCE, Vol. 10, Issue 5, May 2021, pp. 617-621, DOI 10.17148/IJARCCE.2021.105125

[7] Angadi, S. and Katagall, R., 2019. Agrivigilance: a security system for intrusion detection in agriculture using raspberry pi and openCV. International Journal of Scientific & Technology Research, 8(11), pp.1260-1267.

[8] Mendoza, R., Malijan, B. and Caldo, R.B., 2016. Development of smart farm security system with alarm mechanism using image processing. Lpu-Laguna Journal of Engineeringand Computer Studies, 3, pp.73-84.

[9] R. Daroya and M. Ramos, "NDVI image extraction of an agricultural land using an autonomous quadcopter with a filter-modified camera," 2017 7th IEEE International Conference on Control System, Computing and Engineering (ICCSCE), 2017, pp. 110-114, DOI: 10.1109/ICCSCE.2017.8284389.