A Literature Research Review on Animal Intrusion Detection and Repellent Systems

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Abstract. Conflicts between humans and animals have become a big issue in agriculture and the forest zone, putting human lives in jeopardy and causing a huge loss of resources. A wireless sensor-based animal intrusion warning system can overcome these issues, delivering an automatic alert note to the owner and forest authority. The Sensor will detect the animal's movement, and the camera will capture the image. The captured image will be classified using image processing techniques. The Global System for Mobile communications module will send an alarm notification SMS to the forest department or the owner. As a result, the immediate alert information takes corrective decision depending on the type of incursion. This research is being used to learn about the many imaging methods, sensor technologies, and research sets that can be utilized to prevent humans and animals from conflict.

Keywords: Convolutional Neural network, Image processing, Neural networks, Microcontrollers, Sensors networks, database, IoT.

1 Introduction

Conflict of humans and wildlife is one of the main threats revolving around the forest border agricultural lands. The interruption of wild animals toward agricultural fields destroys both property and lives of human beings. Mostly, the wild Animals are interrupting the cultivated lands. An electric fence around the agricultural fields is a better usual approach to avoid animal interference [1]. But this method is expensive and may not be aesthetically pleasing or practicable. Like existing electric fences and poisons, people also used traps to prevent human-animal conflict [2].

Sensor networks and Wireless sensors are used for environmental monitoring to the animal interruption. Moreover, the author explains precision agriculture, which depends on the M2M-based machine and process control [3]. Most of the existing animal detection systems are based on accident prevention due to animal-vehicle collisions. Normally wildlife-human interaction leads to death, injury and also property damage for humans. Nevertheless, this method is intolerable either by society or the government. This study discusses the current state of the art technique for animal detection.

Interestingly, a variety of image processing algorithms for animal detection were presented utilizing various techniques. The proposal's main objective is to develop a smart

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device that protects agricultural fields from animals by repelling them without harming them. In this proposed system, the movement of any object in the surroundings is detected by passive infrared sensors [4]. When movement is detected, the camera will be interchanged to a particular position and stimulated to capture the image. Moreover, the capture outcomes delivered by the embedded computer is classified into different animals [5]. A convolutional neural network is considered for image classification. Based on the animal detected, a repelling sound is played. It is used to drive away from the animal with the help of speakers [6]. In addition, the lights are also flashed at the animal to have a better repelling effect. Wild CENSE, a wireless sensor network system, is being developed to track the movement patterns of Swamp Deer. The meteorological and location information of the animal was captured and relayed to the base station utilizing a peer-to-peer network in this technique.

The base station received data by using radio transceivers. The acquired data is stored in an external data flash memory from each peer node. Each node would send collected information to the database server via the Internet [7]. This proposed model will train the image dataset of wild animals by establishing an AlexNet pre-trained convolution neural network. Further, the extracted features are fed into a multiclass Support Vector Machine (SVM) classifier for classification [8], and this model is saved. The saved model will run on the driver code to compare the trained images with the new test images from the live capture [9]. The image is categorized using the sample photos stored in the database. When a wild animal is identified as an elephant, a bright light is emitted to distract it; if the wild animal is identified as a leopard, a loud noise is employed to distract it [10].As a result, using the GSM module, alarm SMS is issued to forest officials and landowners [11]. Simultaneously, a warning message is given through the public addressing system to warn the people living in the nearby residential area. An SMS is sent to the individual mobile phones of the people who stay around the forest areas.

2 Literature Review Of Animal Intrusion System

The following research papers keep trackof the advancements in research and surveys conducted related to this work. Different methodologies are employed with wired and wireless sensor-based applications to track, monitor, and recognize animals in a diverse environment**.**

2.1 Animal Intrusion Detection System using Neural Networks

Sabeenian et al. 2020 [6] proposed a model that will train the image dataset of monkeys, boar and elephants by establishing a Convolutional Neural Network (CNN), and this model is saved. The saved model will run on the driver code to compare the trained images with the new test images from the live capture. If the one trained animal is discovered during the live capture, an awful sound is produced through speakers to drive the animal away.

Banupriya et al. 2020[7] proposed developing an algorithm to detect the animals in the wildlife area. This programme classifies animals based on their photos, allowing us to monitor them better. Animal detection and classification can aid in preventing animal-vehicle collisions, the tracking of animals, and the prevention of theft. Effective deep learning algorithms can help attain these goals.

Manohar et al. 2019[8] proposed AlexNetbased convolution neural network to classifythe wild animal images. Further, the extracted features are fed into a multiclass Support Vector

Machine (SVM) classifier for classification. Thismethod has a great accuracy rate and a high categorization rate.

Choubisa et al. 2018[12] proposed a system which classified among human and animal images are taken in a side-view method built on the height. LITE (Light Intrusion Detection system dubbed LITE) with a CNN based classification algorithm would also most likely classify a human-crawl as an animal predicted on the system. Based on recorded data, the classification performance or human-crawl vs animal is nearly identical at 95.6% and person with item is at 90%.

Sharma S. et al. 2017[13] proposed utilizing computer vision techniques and automatic animal detection on roads for preventing animal-vehicle collisions. The trained system was on approximately 2200 positive and negative images and video clips of animals crossing highways at varying speeds. According to the two-second guideline, our proposed method can inform the driver when the vehicle speed is 35 km/h. Even if the animal is successfully recognized above this speed, the driver does not have enough time to avoid a collision. In terms of detection, our proposed technique achieves an overall accuracy of around 82.5 per cent. A method for calculating the animal's distance from the camera-mounted vehicle in real-world units is also proposed.

WenlingXue et al. 2017[14] proposed a wireless sensor network based on UWB technology. The grouped signal is recreated in the stage space to demonstrate its characteristic to organize interference recognition by studying Ultrawide Band (UWB) signals. The features are routinely referred into multiple classifiers to detect intrusions, which produces nearly 16 per cent higher correctness than prevailing feature extraction.

UpadrashtaRaviteja et al. 2015[15] established a Passive Infrared (PIR) sensor to detect animal intrusion detection arrangement, which was built in-house and takes the shape of a sensor-tower platform (STP). The conventional signals are modelled. These signals executed a secure quantity of chirplets, an energy signature, and a cross-correlation parameter by the feature's selection parameters. Gathered the information was during the animation-based simulation process. An evaluated the generated data to govern a good set of features for categorization. A Support Vector Machine (SVM) stands for classify the generated feature vector. This classification approach was tested using actual data attained via the STP, demonstrating that the STP design and the sorting methods were extremely effective. The average classification accuracy was over 94%.

A range of pre-processing techniques can use to reduce the effect of factors on the input image. The planned CNN and SVM classification methods have successfully identified animal faces from the constructed animal database. Convolution Neural Networks are a type of Neural Network that is more effective than SVM classifiers in recognizing animal faces. Trnovszky et al. 2017[16] suggested a CNN-based animal recognition method. Implemented Various evaluated methods in MATLAB and C++/Python Programming language, and CNN's obtains overall best precision accuracy of 97 per cent.

SaieshwarRadhakrishnan et al. 2018[17] used image processing to create an animal incursion detection system. A watershed technique segments the animal images, extracts various items in the image, and checks for any animal threat. The Gabor filter is often used to extract a text-rich region and recognize facial expressions at different frequencies. The supervised learning algorithm Linear SVM is used to train the dataset and classify text and hypertext.Only when the specified zone meets other markers does this algorithm build a barrier, which is the contour. This method of animal infiltration detection has a 54.32 per cent overall success rate.

Sourav R. V et al. 2020[18] proposed a system that contains live video investigation camera which attached in specific places. This system has layered manner approach. There are three steps for finding elephant's presence in that places. The first layer is captured the image from video frames. The second layer is identifying that elephant using machine learning methods. Third layer confirmed that occurrence of an elephant in exploitation a pre-trained Convolution Neural Network model. Proposed method is evaluated at 98.7% accuracy.

MohdAzlan Abu et al. 2019[19] proposed a research study on image categorization utilizing the Tensor Flow framework and a Deep Neural Network (DNN), commonly known as Deep Learning. The input data is mostly focused on the flowers category, with five different varieties of flowers employed in this paper. Because of its high accuracy, a deep neural network (DNN) was chosen as the best alternative for the training procedure. Deep learning was also implemented using the Tensor Flow framework, which yielded positive results.It can simulate, train, and categorize five different varieties of flowers that have become a trained model with up to 90% accuracy. In the findings, the accuracy of the image classification is expressed as a percentage. The average score for roses is 90.585 per cent, and the average result for other types of flowers is between 90 and 100 per cent.

MuthukrishnanRamprasath et al. 2018[20] proposed Convolutional Neural Networks (CNN) uses images from handwritten MNIST data sets for image classification. It delivers a 98 per cent accuracy rate. Small, grayscale images are employed in the training process. The Digits of MNIST data set is used as a baseline for grayscale picture classification in this system. The grayscale photos in the training data set necessitate greater processing resources to classify. This system obtains 98% accuracy in the experimental part by training the images using the CNN network. When compared to typical JPEG photos, the processing time for these photographs is extremely long. Stacking the model with more layers and training the network with more image data using clusters of GPUs will provide more accurate results of the classification of images.Table 1 shows that Animal recognition using neural networks.

Table 1: Animal recognition using neural networks

Author	year	Classifier	Objectives
Sabeenian et al.[6]	2020	CNN(Convolutional Neural Network)	Animal recognition
Manohar et al.[8]	2019	AlexNet, Support Vector Machine (SVM) Classifier	Animal recognition Approach
Choubisa et al. [12]	2018	CNN(Convolutional Neural Network)	Animal classification and recognition
RavitejaUpadrashta et al.[15]	2015	SVM Classifier	Animal Intrusion Detection
TiborTrnovszky et al.[16]	2017	CNN(Convolutional Neural Network), SVM Classifier	Animal recognition Approach

2.2 Animal Intrusion Detection and Repellent System using Micro-Controllers

S. Santhiya et al. 2018[1] proposed a system based on Raspberry pi is used to perform several tedious and repetitive tasks. This system detects animals entering farmland using Radio Frequency Identification. It has multiple applications such as detection, counting

animals in the forest, and tracking the animals using the Global Positioning System (GPS), and it is inexpensive. The process is fully automated in this project, and no animals are harmed during repellent.

SnehaNahatkar et al. 2012 [5] developed a low-cost security system to detect wild animals. By detecting the signal in the PIR sensor, this system detects the presence of humans who are not in thermal symmetry with the surrounding atmosphere. When it detects the presence of any person or animal during a specific period break, it sends a call to an already stored GSM modem. After the Microcontroller Unit (MCU) sends sensor signals to the embedded system, the application launches the Web camera, which takes images that are analysed.

Sheela et al. 2016 [9] recommended a low-cost aware system that monitors animals using IoT devices. The PIR device tower comprises a central control unit linked to a web camera via USB and captures the images when a signal is detected and sends them to a cloud server. On the Raspberry Pi, Open CV is installed for image processing. To lower the cost of electric lines, as well as in this study, each sensor tower has solar power installed; The solar panel collects sunlight and uses it to charge the battery, which then powers the sensor tower. Allows battery power to be stored even at night, reducing power consumption.

Roy et al. 2015 [11] suggested a wireless sensor network prototype for animals interference detection in agricultural lands. Two PIR sensors were used in AVR microcontroller boards. When an intruder enters the field, these sensors distinguish the activity of humans or animals, and the Ultrasonic sensor identifies the distance of an object; the sensor board will send an identification message to the source via ZigBee. The farmer receives SMS alert notifications via the GSM module.

Bavane et al. 2018 [21] suggested that a Raspberry Pi based animal's interference detection within low cost. Moreover, the different sensors and cameras are linked with the controller. When PIR sensors detect motion within a 10-meter range, the camera is turned on. The camera automatically obtains an image in motion interference and starts recording video for nearly five to six minutes whilst information is stored non-board within the cloud.If an invader with a valid RFID, usually a farmworker, detects motion, his attendance is automatically recorded. Assume an unauthorised person is identified who does not have a valid RFID tag. In that case, the system examines the image and video for object detection using Haar feature-based Cascade Classifiers. It determines whether the intruder is an animal or a human. A message is generated automatically to the registered number using a SIM900A module to inform about the intrusion.

Telaumbanua et al. 2018 [22] proposed a rat pest control system. This system used an ATMEGA 328 microcontroller equipped with an Arduino Uno board. Four ultrasonic tweeters were fitted as actuators, and four passive infrared sensors (PIR) sensors were installed as sensors. Around the control system framework, actuators and sensors and a 50 Watt solar panel were mounted to collect independent electrical energy. The Control system actuator had a range of 1200m^2, while the Sensor had 78.53 m^2 to detect interference. The Sensor's greatest range with the interference source was 5 meters. The Control system was able to detect interference and fully activate the actuator. The rat took an average of 4 seconds to flee the bait after being exposed to ultrasonic sound waves.

Roxanna et al. 2020 [23] suggested an animal intrusion prevention system and enabled automatic irrigation for improved crop yield depending on the Internet of Things (IoT). The system will diminish farmer's manual operation by continuously observing wildlife interference, soil humidity, and moisture levels. In this paper, the water pump is automated for

irrigation, and alerts are sent before animals interfere in the farm area. This project aims to protect the crop by identifying animal interference with an ultrasonic sensor and constantly observing the soil's water content with a soil moisture sensor and a rain sensor. Furthermore, the project comprises an automatic watering system that uses IoT to automatically turn on and off the water motor based on the soil's moisture level and the climatic condition.

Yadahalli et al. 2020 [24] suggested utilizing an infrared sensor and a motion sensor to identify any movement of intruders. Aside from that, the timing of entry and exit is recorded because a camera is used. This crop protection concept is simple to implement and can be done without harming animals or humans. Furthermore, the components utilized in this system are not overly expensive, delivering it quite possible. As a result, this product can be used to protect farm crops. In place of the current approaches, it could be extremely useful for agricultural applications. It's a straightforward approach to keeping track of things that focuses on agricultural challenges. The product is possible, effective, and keeps track of movements in its immediate vicinity.

In this study, Ashwini V. et al. 2021 [25] proposes a system which contain a camera, PIR sensor mounted on a pole. Camera connected with network via controller. This camera coupled to sensing device. When animal or human was detected by sensor, controller triggers the camera to take picture. This method delivers for energy conservation. This system used to find the animal presence and determined the animals group. Alerts are generated in the latter situation, and residents are contacted via communication networks.

In this study, Brain H. Curtin et al. 2020 [26] proposes finding wildlife of interest using a camera system based on the Raspberry Pi and a deep learning algorithm for image recognition. They built a convolution neural network on a Raspberry Pi 3B+ with TensorFlow and Keras and trained it on almost 3,600 photographs from publicly available picture databases separated into 3 groups. These tests recommend for better accuracy. This system can sense snow leopards with among 74% and 97% correctness.

Marcel Caria et al. 2017 [27] described building a smart farm welfare monitoring system using open and low-cost fog (edge) computing approaches. Raspberry Pi's are used as edge devices in the farm computing solution to generate a fog computing layer that is subsequently connected to the cloud. Here used local farm controller was to connect the edge devices. A fog computing layer is created and connected to cloud computing platforms and a mobile app in the proposed farm computing system. This study proves that several metrics relevant to numerous stakeholders can be collected, aggregated, appraised, and shared, opening new avenues for improving animal welfare and spurring high-tech innovation in this business.

Yang et al. 2020 [28] proposed a blockchain-based architecture that might improve a livestock monitoring system that includes Radio Frequency Identification (RFID) sensors in product manufacturing company. This Instruments addition with RFID tags for physical tracking. RFID tags are used in every production cycle to monitoring the livestock monitoring system. Monitoring system connected with decentralized cloud server. All data are collected and secured in this decentralized network layer. All information’s about livestock monitoring and products improvement were tabulated for easy understanding purpose. Table 2 shows that animal intrusion detection using microcontrollers.

Table 2: Animal intrusion detection using microcontrollers

Author	year	Microcontroller	Sensors	Objectives
Santhiya et al.[1]	2018	Raspberry pi	RFID	Animal Detection
Sheela et al.[9]	2016	Raspberry pi	PIR	IoT based Intrusion Detection system
Sankukumar Roy et al.[11]	2015	AVR	PIR &ZigBee	Animal Intrusion Detection
Telaumbanua et al.[22]	2018	Arduino Uno	PIR	Animal Intrusion Detection Approach
SrushtiYadahalli et al.[24]	2020	Arduino Uno	Motion sensor and I.R. sensor	Animal Intrusion detection in farmlands

2.3 Animal Intrusion Detection System using Image Processing

NidhiDaxini et al. 2015 [29] proposed the Viola and jone algorithm to detect the real-time animal detection system for facial feature detection. The live video is captured from camera and transformed to frame. The database is built by identifying both positive and negative images. Positive photos show creatures that have been detected, whereas negative images show animals that have not been detected. The classifier is tested once the haar-like feature extraction approach is implemented. Even yet, if feature extraction is not performed and we do not have a large training set, the outcome may be incorrect.

MansoorRoomi S et al. 2010 [30] proposed a vision-based technology-based automatic intrusion detection approach.,the present object might be identified as a monkey or a human in the background updated frame. The detection method is then segmented using a low-cost and quick implementation, followed by a skeletonization technique based on stars to fit the object's skeleton, a novel Line Model approach is designed. An alert is activated when the monkey is seen standing upright.

Xiaoyuan Yu et al. 2013 [31] proposed an automated species recognition method. This technique extracts dense SIFT descriptor cell-structured LBP as a local feature using a local cell-structured LBP (Local Binary Pattern) feature, a global dense SIFT descriptor, and (ScSPM) sparse coding spatial pyramid matching. A multi-scale pyramid kernel is used to achieve maximum pooling and weighted sparse coding on a global scale. The dataset, which contains 18 species from two different fields, is classified and tested using support vector machine technology. Even in difficult settings, our approach achieves an accuracy of roughly 82 percent in real-time animal identification.

2.4 Animal Intrusion Detection System using Wireless Sensor Networks

Shanmugasundaram R et al. 2017 [4] proposed tracking animals whereabouts in zoos. The temperature sensor monitors the temperature of the animal, while the PIR sensor detects the presence of humans within the animal's boundaries or restricted areas. Every animal, in

general, has a specific range of body temperature. If the animal has any wounds or a fever, its temperature will immediately climb. To keep track of this, we're utilising a temperature sensor. It monitors the temperature of the animal at all times. If there is a change in the temperature, it will be displayed on the LCD. The presence of humans in restricted areas or near animal borders is detected using the PIR sensor. The voice processor will send a pre-recorded voice alert if a human presence is detected. The position is provided by the GPS receiver. The temperature of the animal is sent to a controller via the Internet of Things. It will deliver all information to the webpage on a computer or laptop.

NiritDatta et al. 2016 [32] created a technique to reduce human and animal harm and death caused by wild animals wandering from national parks and wildlife sanctuaries by using an autonomous tracking and alert system.Combining GSM and GPS technology allows for automatic tracking and alerting. This device is attached to a creature's body and follows the animal's location within zoo. If an animal ventures beyond of the navigation region, an alert in a resident's region, warning people of the impending danger.

Wireless sensor network (WSN) technology was proposed by Santhoshi K. et al. 2018 [33] to detect intrusions in farming. The motion sensor is deployed in several positions to detect motion and deliver with the organiser through radiofrequency.When the detection level rises, the performance of the GSM module sends a text message on the phone to the entrepreneur in agriculture. The GSM module, along with buzzers and an RFID transmitter, is installed near the centralised Sensor, and will act as the interface. In agriculture, radio-frequency identification (RFID) tags are used to distinguish between permitted and prohibited access.

Aiswarya et al. 2018 [34] suggested a new system based on a capacitance switch, which operated with only one electrode to identify the wild animal motion. The electrode can be protected by a non-conductive panel made of wood, glass, or plastic. Biology capacitance, a trait of the man/woman or animal body that offers outstanding electrical properties, is used to power the switch. By detecting variations in capacitance, the LED extends to charge and discharge its metal exterior. When someone touches it, the capacitance increases and the switch is activated. The touch sensor continuously monitors the field and delivers a signal whenever any certain threshold caused by an animal, such as an intrusion, is recognized. When the control system receives this signal, it instructs the relay to activate the alarm circuit. When the threshold time is reached, then an alarm goes off. We use sensors to detect how wet or dry the soil is. If the owner is away, the control system will turn on/off the pump to water the crops based on the soil's dryness if the sensor reading is less than the set threshold (indicating dryness). The motor is ON if the soil moisture level is less than the set threshold and OFF if the moisture level is more than the given threshold.

Sahoo et al. 2017 [35] proposed a Detection System based on a passive infrared sensor that is undetectable and works well in low-light conditions. Once motion is noticed, the controller module triggers the global system based on mobile communication in delivering the interference of humans/animals, which is also utilised to send messages to the involved user. Subsequently, motion is detected in a room, and data is delivered to the central node via sensor nodes in each room, which uses ZigBee for wireless communication. The owner gets a text warning about the interference and uses an IP camera connected to his mobile phone or computer to view in real time.

2.5 Animal Monitoring System using Cloud Database

Yazhini V. R et al. 2018 [2] proposed a motion detection system that uses moisture sensors connected to the raspberry pi. Moreover, the sensors detect the motion, and if the value exceeds the threshold limit, then the notification message is sent to notify the user.

Whilst, a webcam monitors the interference of wild animals such as elephants and small animals into the crop field. The acquired image is analysed to images in the database, including images of possibly dangerous animals. If the taken image matches the image in the database, the Raspberry Pi delivers data to the GSM module, which sends a warning notification to the farmer. GSM also controls the motors. An infrared sensor will detect the heat emitted by the insect's body, while an ultrasonic sensor will detect the sound the insects make.

Kiran et al. 2018 [10] suggested an animal incursion detection system based on IoT. The PIR detects animal movement and immediately controller activates the camera to take an image of the animal or intruder. When the sensor recognizes the intrusion, the trigger pulse is transmitted to the Arduino Uno microcontroller. The sample of pictures stored and grouped with different categories in the folder. If the sensed animal is recognized as an elephant, a high power LED is produced to distract it and away from that area; if the detected animal is identified as a leopard, a loud noise is made to distract it. As a result, using the GSM module, alarm SMS is issued to forest officials and landowners.

Shane PradnyaSambhaji et al. 2019 [36] proposed an early warning system using Internet of Things. Animals images are stored in database which already connected to the Internet of things model. If there is any animal movement, images are taken with a web camera.The moving images are compared to a database and the microcontroller is triggered. After the animal is detected, it generates the alarm and sends an SMS to the user's phone.

Paramasivam et al. 2020 [37] proposed a convolutional neural network-based animal detection algorithm that was executed on a Raspberry Pi control platform. This algorithm was executed in two phases as training and testing. The training phase contains a big data set of 13412 photos categorized into 6 cases for various animals. The taken image is examined for features that correspond to any animal in the trained data set. The web camera's captured animal is next detected and classified. Based on numerous matched objects, the system calculates the percentage correctness. The alert signal can be delivered to the registered user via the BLYNK APP if the accuracy of the detected animal is greater than 45 percent. The practical situation is displayed on a mobile display, captured by a camera, and fed into the raspberry board. The elephant image in the data set is fully visible, but only a portion of it is collected and sent to the controller for image processing due to camera focussing. The result shows 80% of the elephant features match and are hence confirmed as an elephant.

Sugumar et al. 2019 [38] proposed a system that used motion sensors to notice gesture and I.P. cameras towards recognize the animal's movement. After these sensors have satisfied the criterion, send a message to the MQTT broker, who then publishes the message to the LED signs boards mounted along the roads and in animal crossing zones. Our paper makes use of a cloud-based MQTT broker. The node is the hub for all client-server interactions.

Sibanda et al. 2019 [39] proposed motion detection system with infrared imaging camera.that is attached to a car and is used to save the lives of wildlife.The infrared imaging camera identifies the animals by using their body temperature. The technology can significantly improve the safety and lives of road users, which is detected in 65 % of accuracy by the interference of an animal.

2.6 Animal Repellent Systems

The following research papers use repellent mechanisms which get activated on detecting animals. The repellent mechanism consists of ultrasound or acoustic sound, which irritates the animal at a particular frequency; this keeps the animal away from the area.

Using wireless sensors and buzzers that emit acoustic sounds, Uma Maheswari et al. 2016 [3] presented a bird infiltration and detection system. When the sensors in the agricultural area

detect a bird, the acoustic sounds get activated. The birds are irritated by this noise. As a result, the birds will flee when these sounds are produced because they cannot handle the sound. These acoustic sounds will be produced immediately after the birds are identified and will last only a short time before they are driven away.

Yusman et al. 2017 [40] proposed a system that consists of two parts: a dispenser or detector and a receiving part or monitoring location. The sender part also sends sound waves that interfere with wild animals hearing, such as those produced by ultrasonic sensors. The PIR sensor is used to identify animals in cows, goats, monkeys. An animal repellent system was developed using an Ultrasonic sensor. four wild animal species were exposed to various ultrasonic frequencies (25kHz, 30kHz, 35kHz and 40KHz) using a wave generator. Because of the limits of ultrasonic speakers with a frequency response of 3–40 kHz, this signal is made through programming on a microcontroller as an Ultrasonic signal with a maximum frequency range of 40 kHz. It can produce ultrasonic frequency that irritates these wild animals. Wild animals can be found in any zone; therefore, the receiver is utilized to track their movements. The indicator for that zone will be activated by the receiver's mechanism. Until the wild animals leave the range of ultrasonic frequencies, the indicators will continue to illuminate. Table 3 shows that Animal Repellent systems.

Table 3: Animal Repellent systems

Author	**year**	**Repellent mechanism**	**Objectives**
Uma Maheshwari et al.[3]	2016	Acoustic sound	Bird intrusion and detection system
Yusman et al.[40]	2017	Ultrasonic sound	Animal intrusion and early warning system

3 Conclusion

There are numerous issues to consider while creating an animal detecting system. Many wild animals get in conflict with humans when they come in contact with human habitat in search of food and migration pathways that are destroyed due to development activities. As a result, this area must be constantly monitored to prevent wild creatures from entering. Furthermore, the detection of an external surveillance system can be hampered by a brightness problem caused by changes in the natural environment from day tonight. The above papers are involved in monitoring the field using sensors, cameras, and the acquired image is matched to images in the database, including endangered wildlife. If the resulting image verifies an image in the database, the controller sends data to the GSM module, and the planter receives a warning message. So that suitable actions will be taken by repellent mechanisms automatically. The available repellent systems are of fixed ultrasonic waves. Therefore, animals may adapt to the generated ultrasonic sound after a specific period. There is no available repellent mechanism that automatically changes the ultrasonic frequency within a specified range, thus preventing the animal from adapting to a particular frequency. Immense studies should be carried out to identify the unpleasant frequency of the particular animal. Most human-animal encounter occurs during night time where there is only limited visibility to normal cameras used, so the available systems can't identify the animal and change the frequency. New systems should develop with thermal and or night vision cameras, which can monitor the animal's movement even when there is no light.

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