e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:12/December-2022 Impact Factor- 6.752 www.irjmets.com

WILD ANIMAL DETECTION SYSTEM

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DOI : https://www.doi.org/10.56726/IRJMETS32017

ABSTRACT

Human-animal conflict is a serious issue in agricultural fields and forest areas, where a large amount of resources are lost and human lives are at danger. People suffer as a result, losing their property, livestock, crops, and occasionally even their lives. Therefore, it is necessary to regularly monitor this area to stop the introduction of wild animals. In order to construct the system that would monitor the field, we have made an attempt to offer a paper in relation to this issue. This technology first employs a camera to record the image of the trespassing animal before identifying it using a machine learning algorithm. This paper proposes a model that uses CNN based algorithm for classification of animals in images an alert the user by notifying them with a message.

I. INTRODUCTION

Road accidents are frequently caused by wild creatures crossing roadways in forested areas, including elephants, deer, leopards, and tigers. Human-animal collision is a serious problem that affects human safety, property and wildlife. The number of these collisions has increased substantially over the last decades. Furthermore, it is also reported that road-kill ofwild animals had become a significant threat to wildlife population.

Conflicts between humans and animals occur as a result of encroachment and poaching; people move into the forest to support their livelihood; they claim land for agricultural practises; rapid industrialization spreads urban areas; and animals enter nearby villages in the summer for water due to the dryness of nearby water bodies.

There were 222 elephants were killed across the country between 2018-19 & 2020-21 by electrocution. Furthermore, 197 tiger fatalities are being investigated, while 29 tigers were murdered by poachers between 2019 and 2021. Conflicts with elephants resulted in the deaths of 1,579 people in three years, including 585 in 2019–20, 461 in 2020–21, and 533 in 2021–22.. Between 2019 and 2021, Tigers killed 125 people in reserves.

Eight elephant crossing places in the Nilgiris had speed breakers placed (May 4, 2022) —

The National Highway from Mettupalayam to Coonoor and Udhagamandalam has speed breakers erected to reduce the likelihood of motorists hitting elephants and other wildlife.

But speed breakers are not enough for this human animal conflicts which could be overcome by installing detection system that alerts the driver with the animals that are intruding Wildlife may die when crossing highways to access various habitat segments. Road fatalities are a widespread occurrence, particularly in India, which has the second-largest road network in the world with a total length of 63.7 lakh km. On roughly 1,500 kilometres of highways in Tamil Nadu's Valparai plateau, researchers conducted a survey in 2012 and discovered nearly 3,000 animal deaths.

Figure 1: An elephant crosses a road on a highway near the Kaziranga National Park

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This has sparked investigation into potential strategies for creating an animal detection system that alerts drivers and allows them to take preventative action. Therefore, the goal of this project is to create an animal detection system that alerts drivers to potential animal collisions.

In this paper, we concentrate on wildlife monitoring and analysis using camera-trap networks' natural scene animal detection. The high levels of congestion in the image sequences produced from camera-traps make it difficult tospot animals, leading to low detection rates and significantfalse discovery rates.

We have employed a camera-trap database with candidate animal suggestions utilising multilevel graph cut in the spatio-temporal domain to address this issue.

The verification process that determines if a certain patch is an animal or a background is made using these suggestions. Utilizing Deep Convolutional Neural Network (DCNN) features that are self-learned, we have created an animal detection model. The categorization process then utilises this effective feature set, which then classifies and sends alert notification to the driver of the vehicle who have installed the mobile application in the user's phone.

II. LITERATYRE SURVEY

An animal detection model based on SSD and faster R- CNN object detection is designed. The achievement of the proposed and existing method is evaluated by consideringthe criteria namely mean average precision (mAP) and detection speed. [1]

Ultrasonic sensors are adopted at the field's corners, firstdetecting the intrusion, then capturing the image of the invader with a camera mounted on the E-vehicle embedded with a Node MCU Microcontroller that is monitoring the field. The farmer receives a warning via an IoT application.. [2]

The purpose of this study was to implement and evaluate a buried cable sensor system to determine its ability to detect deer and potentially other animals in real worldconditions. [3]

This project focuses on creating a method that can calculate the varied degrees of hazard posed by animals on the road using real-time information on the locations of the animals and the vehicles. The NG RADS can also establish direct wireless connection with vehicles that are at risk using a vehicle-to-infrastructure communication technology, for example, to automatically control a vehicle's speed to prevent colliding with a huge animal. [4]

In order to lessen the severity of DVC, this research presents a CNN-based algorithm to find deer crossing roads. An image is classified using a multi-class CNN classifier that has been trained to look for deer. Using RGB color images, the proposed CNN model is trainedfor both daytime and nighttime vision. [5]

Many big animal images can be found in popular open data sets, however the majority of these do not match the road scenarios required for unmanned vehicle on-board vision systems. The creation of such a tailored data collection using the COCO and Google Open Images datasets is described in the study. [6]

With the use of machine learning algorithms, this methodology enables the features extraction of specific image regions and the classification of those regions into two categories: animal and non-animal. Five different ways were used to navigate the image's pixels as we compared different methods utilizing synthetic images. [7]

Here, motion sensors like PIR sensors and IP cameras havebeen employed to identify animal movement. When the condition is satisfied, these sensors transmit a message to the MQTT broker, who then publishes it to the LED signs boards positioned across the roadways that are designated as animal crossing zones. [8]

The algorithm is capable of spotting animals on highways in a variety of situations. Regarding animal detection, the suggested approach achieves an accuracy of around 82.5%.It is also estimated how far the animals are from the testingtruck. [9]

The nodes of the network incorporate actuators for the activation of warning systems located on the sides of the road as well as radar sensors for the real-time detection of targets approaching the road proximity. For the classification of animal movement, a decision-making strategy based on LBE methods has been put into action and preliminary validated. [10]

In this study, they implemented a wild animal intrusion detection system capable of detecting and reporting damage or intrusion of a traditional fence based on WSN. Different ICT-based tools have been suggested to stop

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crop damage from wild animals like boar, elk, and roe deer, however the majority of them are not feasible or have a limited scope of application. The system mainly focuses oncrop protection .[11]

A system is approached such that an IoT device will bridge the gap between devices and will also enable to monitor animals from anywhere. The information received from the device (GSM, GPS) is live and continuous and it is updated automatically in a separate webpage created with a login ID and Password .[12]

III. PROPOSED METHODOLOGY

The proposed work is based on CNN network and diversePrototype object classification technique. The process of extracting targets or moving foreground from videos or photos is known as target detection.. The quality of it directly affects the performance of subsequent target classification and recognition, target tracking and other algorithms

Finally, predicted positions, precision, recognition rate, and accuracy are calculated. Proposed Diverse prototype has proposed to detect the animal and vehicles in the forest area The animals and vehicle have been located in wooded areas utilising our suggested strategy. Sometimes, wild animals face the problem by human or human face the problem by animals.

To monitor this scenario proposed method has placed in forest areas which plays an important role. With the helpof proposed method, the animal and vehicle has detectedby CNN and display the class of animal and sends a notification to the mobile application of user, so that the user crossing the road will get alerted.

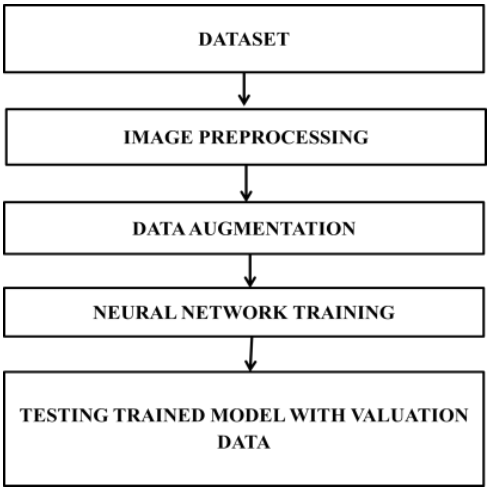

Figure 2: Flow Diagram

Dataset Collection

Appropriate datasets are required at all stages of animal detection research, starting from training phase to evaluating the performance of recognition algorithms. All the images collected for the dataset were downloaded from the Internet, searched by name on various sources in different languages.

These datasets are further used to train the model that is created, so that it can detect the animals using the machine learning algorithm. This algorithm detects the animal based on image preprocessing

Image Pre-Processing

Images downloaded from the Internet will be in various formats, along with different resolutions and quality. In order to get better feature extraction, final images that are intended to be used as dataset for deep neural network classifier were preprocessed in order to gain consistency. Furthermore, procedure of image preprocessing involved cropping of all the images manually, makingthe square around the region of interest, in order to highlight the region of interest

Data Augmentation

The main purpose of applying augmentation is to increase the dataset and introduce slight distortion to the images which helps in reducing overfitting during the training stage.

Image data augmentation is a method for artificially increasing the size of a training dataset by producing altered versions of the dataset's photographs.

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The ability of fit models to generalise what they have learnt to new images can be improved by training deep learning neural network models on more data. Additionally, augmentation techniques can produce variations of the images.

Neural Network Training

The main goal of training the network is for neural network to learn the features that distinguish one class from the others. Therefore, the likelihood that the network will learn the proper features has grown by using more enhanced photos.

Testing and Plotting

Accuracy and loss graphs is plotted using the training history to analyze the efficiency of model. Finally the trained network is used to detect the animals by processing the input images.

Notify User

Once the animal is detected from the captured image, then an alert message is sent to the user to notify them. This message is only sent when the user is within a particular radius from the detected animal, this is done by getting the GPS location of mobile application user.

Notifications to the user will only be sent if they are in a particular radius from the detected animal. This alert message will be sent by accessing the user's GPS location

Figure 3: Notify user in case of animal detected

IV. CONCUSION

In this paper, a CNN framework has developed for object detection. Different from traditional approaches in this field, proposed method integrates a Prototype detection network and CNN into a single network. Vehicle and wild animal detection is a recently growing technique to detect the wild animals in critical forest areas. When humans travel through the forest roads, animals may be hunted by humans or humans may be attacked by animals. The major advantage of this method is, it has detected and determine problem by who initiate the problem. This can stopped by sending notification to the vehicle drivers using a mobile application.

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