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Animal Intrusion Detection System

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ABSTRACT

Struggles between people and animal cause big problem in farm and forest , leading to substantial resource losses and endangering human lives. People endure the loss of property, livestock, crops, and sometimes even their own lives. Consequently, consistent monitoring of these areas is imperative to prevent wild animal intrusions. To address this issue, we present a research paper proposing a technological solution. This technology utilizes cameras to capture images of trespassing animals, which are then identified using a machine learning algorithm. Specifically, our paper introduces a model employing a Convolutional Neural Network (CNN)-based algorithm for animal classification in images. Furthermore, it alerts users by sending them notification messages.

Keyword:- human-animal conflict, agricultural fields, forest areas, resources, property loss, livestock loss, crop damage, endangerment, monitoring, wild animal intrusions, technological solution, cameras, image capture, machine learning algorithm, Convolutional Neural Network (CNN), animal classification, notification messages

I. INTRODUCTION

Road accidents caused by wildlife crossing forested roadways, including elephants, deer, leopards, and tigers, pose a significant threat to clashes between humans and animals are getting worse, putting people, their belongings, and wildlife at risk. This has led to a big increase in wild animals being hit by vehicles on roads.. Conflicts between humans and animals arise due to encroachment, poaching, agricultural expansion, urbanization, and wildlife seeking water in nearby villages during dry seasons. Electrocution claimed the lives of 222 elephants between 2018-19 & 2020-21, with 197 tiger fatalities under investigation and 29 tigers killed by poachers from 2019 to 2021. Elephant conflicts resulted in 1,579 human deaths over three years, while tigers killed 125 people in reserves between 2019 and 2021. Although speed breakers were installed at eight elephant crossing points in the Nilgiris, they are insufficient to address human-animal conflicts, necessitating the installation of detection systems to alert drivers of intruding animals. Wildlife fatalities during highway crossings highlight the urgency of addressing road safety. India, with The world has the second biggest system of roads, stretching across 6.37 million kilometers. faces widespread road fatalities, as evidenced by a survey revealing nearly 3,000 animal deaths along 1,500 km of highways in Tamil Nadu's Valparai plateau in 2012.

The increasing concern surrounding road accidents involving animals has prompted the exploration of effective ways to make a system that can spot animals easily capable of alerting drivers and mitigating potential collisions. Consequently, this project endeavors to develop a system aimed at warning drivers about the presence of animals on roadways. This study delves into wildlife monitoring and analysis, specifically focusing on utilizing camera-trap networks for the detection of animals in their natural environments. However, the complexity of image sequences generated by camera-traps often poses challenges in accurately identifying animals, resulting in low detection rates and a high number of false alarms.

To address these challenges, We use a system that combines a database of camera-trap images with suggested animals identified using advanced techniques involving graphs and space-time analysis.

These suggestions aid in the verification process, enabling the system to discern between animals and background elements.

Furthermore, our approach utilizes Deep Convolutional Neural Network (DCNN) features, which are learned autonomously, to construct a robust animal detection model. This model is subsequently employed in the categorization process, accurately identifying potential animal threats and issuing alert notifications to drivers who have installed the corresponding mobile application on their smartphones.

II. LITERATURE REVIEW

In farming, a crucial objective is to protect farmland from animal damage. Traditionally, farmers used fences to safeguard their crops, but wild animals continue to pose a unique challenge worldwide. Creatures like deer, wild boar, rabbits, and elephants can cause significant harm to plants by feeding on them or trampling them.. However, excessive use of electricity in electric fences can harm not only wild animals but also pets and humans.

To address these challenges, a new approach is being implemented, involving digital cameras and machine learning algorithms to detect and alert the presence of wild animals. Nirit Datta and Souvik Sarkar demonstrate the use of automated surveillance and alerting systems to prevent injuries and fatalities Resulting from wild animals wandering in national parks. Similarly, Sachin Umesh Sharma and Dharmesh J. Shah propose an innovative pricing technique for automatic animal detection on roads to prevent collisions with vehicles.

R. Shanmugasundaram introduce a gadget meant for monitoring animals in zoos and national parks. It comes with sensors for temperature and Passive Infrared. sensors to monitor animal presence and human intrusion. This device can send alerts to humans and display animal information on a screen connected to the Internet of Things. Additionally, S. Aparna Propose a step-by-step approach to set up a system that categorizes wildlife sightings and sends alerts using GSM technology.

Finally, Mriganka Gogoi propose Methods for using video cameras to watch things happening in real-time of selected environments, focusing on scene atomization and interaction prediction. By analyzing video frames and extracting morphological features, their approach aims to detect and respond to wildlife activities promptly. However, challenges remain, such as the limitations of covering large areas and tracking multiple animals simultaneously.

III. PROBLEM DEFINITION

Animal assaults have become a frequent occurrence in present-day India, resulting in the devastation of villages and the ruin of crops due to the absence of a reliable detection system. In the absence of adequate protective measures, individuals are left vulnerable to their fate. Thus, the implementation of a robust detection system holds the potential to not only save lives but also safeguard crops. Moreover, the interference of animals exacerbates the destruction of villagers' crops. The rapid depletion of forests and encroachment onto agricultural land have led to a surge in animal attacks on fields, triggering a significant shift in farmers' attitudes towards wildlife. Achieving harmony between farmers and wild animals appears to be an elusive goal.

IV. EXISTING SYSTEM

Existing approaches use Electric fences are installed to safeguard crops from wild animals, but they pose risks to animals and humans. They're employed to prevent attacks by wild animals. but they are not electric An approach using digital technology to detect animals. The screen is on the device, but it's sending A manual message to forest officials will no longer drop people to agricultural land. There are many invaders popularity issue. The traditional strategy for identifying animals in the garden involves the use of humans. The eye sees animal behavior. Although these costs are very large, they are not earned by large farms It is possible to continue to show people the movement of animals at any time of the day. Attack the animal in side steal yard or crops. Huge losses in human resource development. Wildlife encroaching into highly populated areas can be dangerous for both humans and animals. Keeping track of these animals is challenging due to their large range and unpredictable movements. Device failures occur because of difficulties in recognizing and tracking them effectively. The attack killed the village and destroyed its facilities. Livestock was destroyed by the combined attack. Many Farmers often resort to electric fences as a method to protect their land. However, these fences can be quite expensive to install and maintain. They require a lot of energy, especially if the area to be fenced is large. Moreover, the electric shocks from these fences can sometimes be fatal to animals, which is crucial for farmers. There are many challenges ahead to solve this problem and some of them are very difficult can be done.Despite advancements in social justice, there are still challenges in monitoring and analyzing visitors to computer community websites for evidence of malicious activities. While business automation frameworks using IT are dependable, they have become increasingly complex and require regulation and oversight. sometimes by generating external and monitoring random work External remote control devices can also be used by attackers facilities or apartments. few conventional structures and programs focus on long-term protection. In rare cases, the structure and program It can be used even after deployment in a very rare and avant-garde environment. Ultimately, the ability to detect certain attackers falls short of expectations. The current system for detecting intruders on farms has many shortcomings.

V. METHODOLOGY

Innovative Approach with Underactuated Mechanism

Livestock farming increased, resulting in reduced crop yields and loss of people's livelihoods. Roads and animals entering the field can be affected in many ways, including damage to plants, inadequate food and water, human exposure, disease and death. In the proposed machine, the entire process uses a digital camera and involves two levels of animal recognition. We use digital cameras to capture animals entering the land, and one we detect the animals, we take photos and send them to work.

When it is finished, a notification (news) is sent to the farmer The phone and its price are quite economical. Design: To examine the entire performance of machine, we design the following subsystem as shown in figure

(a):Recognition engine: (i) Camera, (ii) photo taking, (iii)Before and identification of animals, (iv) photo storage. When we have a digital camera on our farm, it starts taking photos constantly when the animal enters the farm, sends it back when it doesn't leave, and the digital camera takes photos when the animal is not being followed.When a wild animal is photographed, whether it matches the information we have collected or not, the photo is sent for preprocessing and animal identification. Animal research is the most important mechanism for the integration of animals and humans. When an animal is identified, The digital camera is fooled into capturing certain pictures. These images are then analyzed to identify the animal based on its distinctive features, and the analysis result is sent to the server for storage. If the message isn't received by the server, the camera is instructed to take more photos during the session.

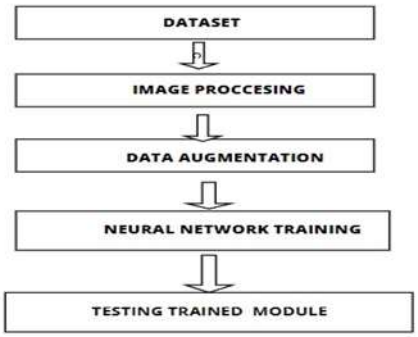
Responsible fordelivery of the completed document

This is done by creating a notification (message) onthe farmer's phone when the animal is matched; otherwise it will be repeated to determine whether t he Alert was generate,

VI. RESEARCH OBJECTIVE

1. Detect and capture animals in the vicinity of the farm field.
2. Utilize image processing techniques to classify the detected animals.
3. Notify farmers about the presence of animals through an Android smartphone.
4. Implement measures to safeguard the farm from potential attacks by wild animals.

VII. RESEARCH METHODOLOGY



FLOW DIAGRAM

The suggested method uses a type of advanced computer system called Convolutional Neural Network (CNN) along with a variety of models for classifying different objects. Detecting targets involves separating moving objects from videos or pictures, which is important for later processes like identifying, recognizing, and tracking the targets. The quality of target detection directly impacts the performance of these subsequent processes.

The proposed method aims to detect animals and vehicles in forest areas using the diverse prototype approach. This method effectively identifies animals and vehicles within wooded regions. Additionally, it addresses situations where both humans and animals encounter difficulties.

To tackle these difficulties, the suggested method is put into use in forest areas for monitoring.

Using CNN, it detects animals and vehicles, displaying their classification. Moreover, it sends notifications to users via a mobile application, ensuring that individuals crossing the road are alerted to potential hazards.

Dataset Collection:

Gathering appropriate datasets is crucial for animal detection research, from training the model to evaluating algorithm performance. Pictures for the dataset are gathered from the internet by searching through different sources in various languages. These pictures are then employed to teach the model how to recognize animals using a machine learning algorithm.

Preparing Images:

Picture obtained from the internet, they undergo pre-processing to make sure they all have the same format, resolution, and quality. This helps in better extracting features from the images for the dataset.

This involves manually cropping all images to create a square around the region of interest, highlighting the key area.

Data Augmentation:

Expanding the dataset is used to make the dataset larger and slightly change images, which stops the model from becoming too specialized during training. This means creating modified versions of the pictures in the dataset.

Neural Network Training:

The neural network is trained to learn features that distinguish one class from another. By using more enhanced photos, the likelihood of the network learning the correct features increases. Training on a larger dataset and applying augmentation techniques can improve the network's ability to generalize to new images.

Testing and Graphing:

Accuracy and loss graphs are created using the training data to see how well the model works. Once trained, the network is used to find animals by analyzing input images.

Notification to User:

A notification is sent to the user when an animal is detected in a photo, but only if the user is nearby, as determined by their GPS location.

VIII. CONCLUSION

This research paper introduces a new method for detecting objects using a CNN framework. Unlike traditional methods, our approach combines a Prototype detection network and CNN into a single network. Our main focus is on identifying vehicles and wild animals in significant forest regions. When individuals travel along forest pathways.

There's a risk of humans hunting animals or being attacked by them. Our method helps identify who initiates these problems. We plan to address this by sending notifications to vehicle drivers via a mobile app. The problem of wild animals damaging crops has become a big issue in society. Often, these animals are killed in retaliation or to prevent further damage. To address this problem,

we're looking into using cameras in fields to monitor for wildlife and take pictures of intruders. We'll Use image processing to accurately identify animals and display their pictures for better results. This information can help protect crops.

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