Intelligent Alert System Using Hybrid Deep Learning for Wild Life Monitoring

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ABSTRACT–Crop damage from animals and birds is a big problem for farmers in India. As farmland expands into wildlife habitats, animals raid crops, causing lower productivity. Traditional methods to stop them are not effective, and hiring guards is impractical. To solve this, we propose using deep learning algorithms, a type of artificial intelligence, to detect animals on farms using cameras. When an animal is detected, we play sounds to scare it away and provides alert message to the user. Our study explains how we built this system using advanced computer vision techniques. This helps protect crops while keeping both humans and animals safe.

Index Terms - Animal detection, Deep Learning Algorithms, Artificial Intelligence.

I.INTRODUCTION

The development of urban ranges in advanced times has brought about in broad relocation of environments in forested ranges. As a result, wild creatures are constrained to wander into the human settlements that frequently encroach on their schedule exercises. More regularly than not, nourishment is the essential inspiration for such peregrinations. It is at this point that there's unmistakable peril to any people that incidentally cross the way of these creatures when they are at their most fierce inclinations. Thus, a require emerges for the location of wild creatures at the border of human settlements near to wild territories. A vigorous, solid and viable preemptive caution instrument would radically dispense with chance of deadly human-animal conflict, both within the intrigued of ensuring human lives and maintaining a strategic distance from misfortune of imperiled creatures. Besides, such a framework would moreover be valuable in natural life havens and biosphere saves to screen the development of creatures at the border zones of such foundations which have regularly demonstrated troublesome to control. The usage of innovation and vigorous cameras isn't an outsider concept in most major biosphere saves and national parks around the world. In spite of the fact that there has been a significant sum of advance, software-based devices have not been investigated to a palatable degree in these utilize cases. Computer vision has the capacity to convert the following and checking prepare with the precision that its components and supporting strategies give. The automation-augmented lessening of man-hours contributed in looking for and following wild creatures is

perhaps the greatest potential boon that computer vision can give. The pre-processing included within the application of computer vision calculations is frequently under- documented in spite of the fact that it plays a key part within the victory of the calculation. A profound understanding of the nature of the inputs is fundamental to create fitting changes at pivotal junctures of handling to meet the often-convoluted criteria required by complicated deep learning calculations. Changing the pictures is constantly required due to the sporadic nature of real-world information bolsters. The nonattendance of an fake amalgamation component within the generation of inputs by means of crude camera stills includes to the complexities included within the picture handling component. In this paper, we are performing classification of wild creatures recorded within the IUCN Ruddy List of Undermined Species. The dataset for the same has been sourced from Kaggle[1]. The pictures are captured in different lighting conditions and situations subsequently making our calculation more able of genuine world arrangement in preservation.

II.LITERATURE SURVEY

wildlife protection has had a significant number of approaches which integrate myriad technology stacks to solve niche issues Background modeling helps generate region proposals for foreground objects, which are then classified using the DCNN, resulting in improved efficiency and increased accuracy. The proposed system achieves 82% accuracy in segmenting images into human, animal and background patches [2]. A.V Sayagavi et al. [3] used a network of cameras, only when some movement is detected. The images captured through these cameras are processed to detect the presence of wild animals using YOLO, and if an animal is found, identify the species. Once identified, the animals are tracked for a suitable time using CSRT in order to determine their intent – such as to find whether they are moving across the village, or into it. In the latter case, alerts are generated and local authorities are notified through proper channels. The models at present can detect 5 types of animals namely (elephant, zebra, giraffe, lion and cheetah). A comparative study on 4 different algorithms based on deep neural networks has also been proposed in [4]. Two variants of single shot multi box detector (SSD) and two variants of faster region-based CNN (Faster R-CNN) have been compared. Two different activation functions are also compared. The SSD variants outperform all faster R-CNN variants and provide more precise detection compared to the latter. Non-intrusive monitoring of animals was explored by A.G Villa et al. [5]. They generated huge volumes of data as they made use of multiple camera trapping networks. To analyze the data, they used a very deep CNN framework and chose 26 species from the Snapshot Serengeti (SSD) dataset. The proposed model achieved an accuracy of 88.9%. A comparison with other techniques was also carried out which showcased that their model outperformed previous approaches. An automated wildlife monitoring system which leverages state-of- the-art deep CNN architecture has been devised [6]. The model achieved 90.4% accuracy for 3 animal classes. A single labeled dataset was used for training purposes, and a focus is placed on filtering animal images. A comparative study between the bag of visual words and deep learning CNN techniques for wild animal recognition [7]. The comparison is done for grey level as well as color information. The features extracted by the BOW models were combined with a regularized L2 support vector machine for classification. This study suggests that there is a clear performance gulf between CNN methods and BOW. In [8] YOLOv3, a CNN architecture as a pre- trained model through transfer learning technique is used. Fine tuning was subsequently performed using an amalgamation of self-shot and crowd sourced images. The model locates the object detected and adds a bounding box upon it. PROBLEM STATEMENT

Wildlife monitoring and analysis are an research field since many decades. Developing a deep learning model to accurately detect and deter animals and birds from damaging crops, ultimately reducing agricultural losses and increasing crop yields." This statement outlines the goal of using deep learning technology to address the specific issue of protecting crops from wildlife interference.

ALGORITHM

Convolutional Neural Network(CNN): Convolutional Neural Networks (CNNs) are a type of deep learning algorithm designed for analyzing visual data. They use principles from linear algebra, specifically convolution operations, to extract features and patterns within images. Inspired by the human brain's visual cortex, CNNs efficiently interpret visual information to process entire images. They excel at tasks like image recognition and object detection, with applications in self-driving cars, facial recognition, and medical image analysis. Compared to older neural networks, CNNs offer a more comprehensive approach to image processing, outperforming traditional networks on various image-related tasks and, to some extent, speech and audio processing.

Recurrent Neural Network (RNN): is a type of Neural Network where the output from the previous step is fed as input to the current step. In traditional neural networks, all the inputs and outputs are independent of each other. Still, in cases when it is required to predict the next word of a sentence, the previous words are required and hence there is a need to remember the previous words. Thus RNN came into existence, which solved this issue with the help of a Hidden Layer. The main and most important feature of RNN is its Hidden state, which remembers some information about a sequence. The state is also referred to as Memory State since it remembers the previous input to the network. It uses the same parameters for each input as it performs the same task on all the inputs or hidden layers to produce the output. This reduces the complexity of parameters, unlike other neural networks.

You Only Look Once (YOLO): YOLOv3, short for You Only Look Once, Version 3, is an advanced real-time object detection algorithm that is capable of identifying specific objects in videos, live feeds, or images. This machine learning algorithm leverages features learned by a deep convolutional neural network to accurately detect objects. In the YOLO approach, the input image is divided into an $S \times S$ grid. If the center of an object falls within a particular grid cell, that specific cell is responsible for detecting that object. Additionally, each grid cell predicts B bounding boxes and confidence scores for those boxes, enabling precise and efficient object detection.

Advantages :

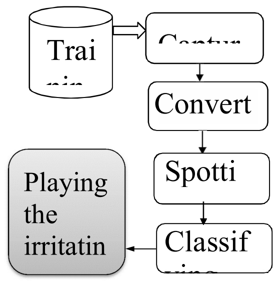
1) CNNs are adept at automatically extracting relevant features from images, reducing the need for manual feature engineering.

2) YOLO is known for its fast and efficient object detection capabilities, making it ideal for real-time applications such as wildlife monitoring. It can quickly detect and track animals in video feeds, allowing for timely alerts to be generated.

3) RNNs are designed to handle sequential data, making them well- suited for tasks such as natural language processing, time series analysis, and speech recognition.

Block diagram

An animal and birds dataset is developed and trained in a way that each images are extracted to it.Now capture the video through camera after capturing video the YOLO algorithm converting video to frame for spotting the specific object. After identifying the object CNN classification algorithm is functioned by using pattern matching based on the data set. Then they provide output as Playing the irritating sound and alert message to the User.



Working

Dataset Development and Training:

An extensive dataset is compiled containing images of various animals and birds. Each image in the dataset is labeled with the corresponding class. This dataset is then used to train a machine learning model, typically a convolutional neural network (CNN). During training, the model learns to recognize and classify different animals and birds based on the provided images and labels.

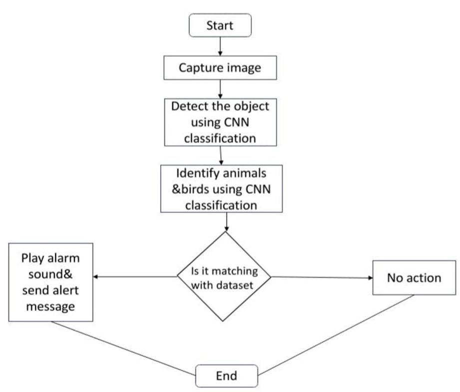
Video Capture and Processing:

Using a camera, a video is captured in real-time. This video stream consists of a sequence of frames. The YOLO (You Only Look Once) algorithm is employed to process each frame of the video. YOLO is an object detection algorithm that can identify and locate multiple objects within an image or video frame in real-time. YOLO processes the video frames and detects the presence of specific objects, such as animals or birds, based on its training.CNN Classification:

Once YOLO identifies an object in a frame, the detected object is passed to a CNN classification algorithm. The CNN classification algorithm utilizes pattern matching techniques. It compares the features of the detected object with those learned during the training phase on the dataset. If the features of the detected object match those of a known animal or bird class in the dataset, the object is classified accordingly.

Output Generation:

If a match is successfully made by the CNN classification algorithm, the system generates an alert message to notify the user. Additionally, to draw the user's attention, the system may play an irritating sound or trigger any other predefined action. This output serves as a warning or notification to the user about the presence of specific animals or birds in the captured video.



CONCLUSION

Implementing an intelligent alert system for wildlife monitoring offers numerous benefits for conservation efforts and research. By utilizing advanced technologies such as computer vision, machine learning, and real-time data processing, wildlife monitoring systems can effectively detect and track wildlife movements, identify potential threats, and provide timely alerts to stakeholders. This proactive approach allows for quicker response times, better decision-making, and improved conservation outcomes. Additionally, intelligent alert systems can help minimize human-wildlife conflicts, protect endangered species, and enhance overall ecosystem health.

Overall, integrating intelligent alert systems into wildlife monitoring practices is a valuable tool for promoting biodiversity conservation and sustainable wildlife management.

VII.FUTURE ENHANCEMENT

In the future, intelligent alert systems for wildlife monitoring could benefit from advancements in deep learning techniques such as object detection and recognition. By training deep learning models on large datasets of wildlife images, these systems could become more accurate in identifying and tracking specific species. Additionally, incorporating real-time data streams from sensors and cameras in the field could enable quicker response times to potential threats or unusual behavior. Overall, the integration of deep learning technology has the potential to greatly enhance the effectiveness of wildlife monitoring systems. This work can be further extended by sending an alert in the form of a message when the animal is detected to the nearby forest office.

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