A PRACTICAL ANIMAL DETECTION AND COLLISION AVOIDANCE SYSTEM USING COMPUTER VISION TECHNIQUE

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ABSTRACT
One serious problem that all the developed nations are facing today is death and injuries due to road accidents. The collision of an animal with the vehicle on the highway is one such big issue, which leads to such road accidents. In this paper, a simple and a low-cost approach for automatic animal detection on highways for preventing animal-vehicle collision using computer vision techniques are proposed. A method for finding the distance of the animal in real-world units from the camera mounted vehicle is also proposed. The proposed system is trained on more than 2200 images consisting of positive and negatives images and tested on various video clips of animals on highways with varying vehicle speed. As per the two-second rule, our proposed method can alert the driver when the vehicle speed is up to 35 km/h. beyond this speed, though the animal gets detected correctly; the driver does not get enough time to prevent a collision. An overall accuracy of almost 82.5% is achieved regarding detection using our proposed method.

I INTRODUCTION
Today's automobile design primarily depends on safety measure, security tools and comfort mechanism. The approach has facilitated the development of several intelligent vehicles that rely on modern tools and technology for their performance. Machine learning is a subsystem of artificial intelligence that makes systems involuntarily learn and progress from experience without being programmed. Machine learning focuses on the growth of computer programs that can access data and utilize it to learn for themselves. The learning process starts with interpretation or data, like examples, previous model, or suggestions, in order to take improved decisions in the future. The principal aim is to permit the computers train themselves without human intrusion or assistance and corrects its mistakes themselves through this learning. Deep neural networks are the collection of algorithms that have placed new records in precision for several vital problems; Convolutional neural networks (CNN) is a type of deep neural networks, most generally applied for investigating visual images. Compared to other image classification algorithms, CNNs employ fairly modest preprocessing. This liberty from past knowledge and human intervention in feature design is a key benefit of Convolution neural network (CNN).
They have several applications in the field of image and video recognition, recommendation systems, image classification and medical image processing. Examining wild animals in their natural environment is an essential task in ecosystem. Due to the enormous growth in human inhabitants and the increase in hunt of economic development makes excessive exploitation of natural resources, fast, innovative and significant changes in the Earth’s ecosystems. An expanding region of the land surface has been changed by human activity, modifying natural life populace, habitat and behavior. More fatally, many wild animals on the Earth have disappeared, and many species are locomoted into new places where they can disturb all natural and human resources.

II LITERATURE SURVAY

Fang, Y., et al. [1] discussed a technique to move animal detection by taking benefit of global patterns of pixel motion. In the dataset, where animals make obvious movement against the background, motion vectors of every pixel were estimated be applying optical flow techniques. A coarse segmentation then eliminates most parts of the background via applying a pixel velocity threshold. Using the segmented regions, another threshold was used to filter out negative candidates, which could belong to the background.

Jaskó, G., et al. [2] presented a system capable of detecting different huge sized wild animals from traffic scenes. Visual data was obtained from a camera with monocular color vision. The objective was to analyze the traffic scene image, to locate the regions of interest and to correctly classify them for discovering the animals that were on the road and might cause an accident. A saliency map was generated from the traffic scene image using intensity, color and orientation features. The salient regions of this map were assumed to be regions of interest. A database was compiled from a large number of images containing various four-legged wild animals. Relevant features were extracted from these and were utilized for training Support Vector Machine (SVM) classifiers.

Nguyen, H., et al. [3] investigated a main obstacle to scientists and ecologists to monitor wildlife in an open environment. Leveraging on recent advances in deep learning approaches in computer vision, a framework was introduced to build automated animal recognition in the wild, aiming at an automated wildlife monitoring system.

Parham, J., et al. [4] proposed a 5-component detection pipeline to utilize in a computer vision-based animal recognition system. The result of this approach was a collection of novel annotations of interest (AoI) with species and viewpoint labels. The concept of this approach was to increase the reliability and automation of animal censuring studies and to offer better ecological information to conservationists.

Matuska, S., et al. [5] discussed a new approach for object recognition by using hybrid local descriptors. This approach was utilized a combination of a few techniques (SIFT - Scale-invariant feature transform, SURF - Speeded Up Robust Features) and consists of second parts. The applicability of the presented hybrid techniques were demonstrated on a few images from dataset. Dataset classes represent big animals situated in Slovak country, namely wolf, fox, brown bear, deer and wild boar.
Xue, W., et al. [6] utilized a wireless sensor network based on UWB technology for deploying intrusion detection. By analyzing the characteristics of Ultra-wide band (UWB) signals, convolution neural network (CNN) was employed for learning the characteristics of UWB signals automatically. The SVM or Softmax classifier was utilized for classifying human beings from animals.

III THEORETICAL BACKGROUND

3.1 PROBLEM IDENTIFICATION

The various practical solutions available for automatic detection and recognition of animal for highways are going on. These are the gaps we found during automatic animal detection: Animals in distinct forms, dimensions, stances, colors, and conduct are not completely predictable in comparison with walking or other objects, which are the biggest problem. Although human beings have a beautiful basic shape and size, animals do not share the average and standard. Animal detection is comparatively easier if the device is looking for an animal (say cat) to be detected. However, inherently acknowledging many animals needs the ability to distinguish between one animal and the other, although they may not be of the same sort. Such a issue for computers is very hard if they do not understand about animals’ different opportunities. Given the complications apart from a moving or stationary animal, along with the interest involved in identifying the animal on the roads, there are other objects such as vehicles, pedestrians, shade of trees and other objects that make the animal very difficult to detect.

Disadvantage:

- Animal Not detected current system
- Less experience
- Can be forgotten or lost
- Environment and usage can affect measurements
- Systems are not 100% accurate

3.2 PROBLEM SOLVING

Object detection (OD) is a technologically difficult and practically helpful computer vision issue and has seen important progress in recent years. In computer vision (CV) and picture processing, detection and classification of objects are significant tasks. Classification of objects could be considered a normal problem of recognition of patterns. Unlike people who can easily recognize any object in the actual globe, it is a hard job to computerize object recognition in picture. The Detection and classification of animals is a challenge for the scientist owing to numerous problems that decrease performance and effectiveness. Effortlessly and instantly, humans conduct object recognition. Algorithmic description of this assignment was very hard to implement on computers. In the case of videos, the basic input to the OD system may be an image or scene.

The fundamental purpose of this scheme is to identify objects (animals) current in the picture or scene, or merely to categorize the different objects (animals) into the corresponding object classes. The issue of object detection can be described. Due to an image comprising one or more interesting objects and a set of labels corresponding to a set of models known to the system, the system is intended to assign accurate labels to the regions of the image.
The problem of object detection cannot be solved until the image is segmented and segmentation process cannot be implemented without at least partial detection. The word detection was used to refer to numerous distinct visual capabilities which include the identification, discrimination and categorization. In this paper we will discuss the various techniques and methods adapted by the researchers in past few years.

**Advantage:**

- Comparing the animal and confirms or continues to refuse the identity of the discovered animal (the one-to-one matching). Even though verification and identification often share the same classification algorithms, the two modes are intended for specific applications.

- Identification—compares the picture of the animal with all other animals in the database and gives the matches a categorized list (one to n matching).

- To better comprehend the task and issues of animal identification and recognition, the following factors have to be considered because the outcomes of animal detection and recognition system may be greatly impaired:

### 3.3 ARCHITECTURAL DESIGN

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Input Images from frames

Apply Preprocessing

Human Face Detection

Warning Sign Detection

Road side Car Detection

Tree Detection

Animal Detection

Notification to User
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HOG / BOOST
4.1. PREPROCESSING
Here doing pre-processing steps to enhance the image. For feature extraction and learning of the system. Preprocessed method is implementing to reduce the noise from input image it's another important method for filtering. In this system using a combination of HOG and boosted cascade classifier for animal detection. All the image processing techniques are implemented in mat lab software.

4.2. FEATURES EXTRACTION
Feature extraction in image processing is a technique of redefining a large set of redundant data into a set of features of reduced dimension. Transforming the input data into the set of features is called feature extraction. Feature selection greatly influences the classifier performance; therefore, a correct choice of features is a very crucial step. In order to construct an effective feature set, several published articles were studied, and their feature selection methodology was observed. It was noted that certain features were widely used as they gave a good classification. We implemented these features on whole images in our system. Those features were considered to boost the classifier performance. Use analysis techniques on a segmented image to mark the location and size of complete and non overlapping cells in a microscopic image.

4.3. SEGMENTATION USING K-MEANS ALGORITHM
K-Means is a least-squares partitioning method that divide a collection of objects into K groups. The algorithm iterates over two steps:
1. Compute the mean of each cluster.
2. Compute the distance of each point from each cluster by computing its distance from the corresponding cluster mean. Assign each point to the cluster it is nearest to.
3. Iterate over the above two steps till the sum of squared within group errors cannot be lowered any more.

4.4 CLASSIFIED FEATURES
Classification includes a broad range of decision-theoretic approaches to the identification of images (or parts thereof). All classification algorithms are based on the assumption that the image in question depicts one or more features (e.g., geometric parts in the case of a manufacturing classification system, or spectral regions in the case of remote sensing, as shown in the examples below) and that each of these features belongs to one of several distinct and exclusive classes. The classes may be specified a priori by an analyst (as in supervised classification) or automatically clustered (i.e. as in unsupervised classification) into sets of prototype classes, where the analyst merely specifies the number of desired categories. (Classification and segmentation have closely related objectives, as the former is another form of component labeling that can result in segmentation of various features in a scene.)

4.5 CLASSIFICATION
This classification result gives the details about tree, human, car, and also to detect the road crossing animal .to get the spitted part from the k means segmentation result. Above the result which is used to recognize the road crossing animal from this module. Classification result generates the k-means cluster and also use object detection algorithm.
V CONCLUSION & FUTURE WORK

5.1 CONCLUSION
The automatic detection and classification of animal image. We faced many problems during the detection and image classification of animal such as large variation in shape and color appearances, light/illumination conditions problem. In recent years, with the increasing importance of animal identification and tracking, animal recognition algorithms have received more and more attention, and the application of neural networks has opened up new and individuals. This paper uses this principle to animal detection algorithm for animal identification studies. The experimental results show that the optimal feature extraction algorithm and optimization algorithm are obtained. It is hoped that later researchers will be able to conduct more in-depth research on this basis to further improve the performance of animal recognition algorithms based on neural networks for animal identification. Animal characteristics help to better describe and identify different species. However, there still exist research gaps for the further improvement and innovation in this area.

5.2 FUTURE ENHANCEMENT
Most animal detection systems are found to have their own advantages and disadvantages. Yet in a country like India, given the growing number of accidents with stray animals, there is no realistic implementation of such systems. Future research needs to expand in order to develop a device capable of detecting animals during the day, at night and also in fog. In foggy weather, none of the existing systems promised to detect animals. In fact, most AVCs (Animal Vehicle Collision) occur when dogs or cows strike the vehicle in urban environments, so we need to concentrate on identifying animals like dogs and cows instead of moose or giraffe. The effectiveness of a system depends on two factors: the reliability of detection and the signaling of the animal to the driver. On both day and night, it performed well. In contrast, RADAR is also capable of working in harsh weather. Those two can be further expanded to make it work on highways (background continues to change) and in real time. The most important fact to communicate with the driver is to tell well in advance so that the driver has ample time to take the action. All of these criteria have created a large area for further animal detection and alarm system work to be applied on a large scale.

REFERENCE
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