Research Article

A Review On Animal Detection   Using Different Detection Techniques

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Abstract

Detecting the animals is an imperative task in the field of computer vision. The computer vision plays a prominent role in detection of various wild animals. Methods for animal detection are helpful to know about the moving behaviour of animals so as to prevent animal intrusion which results in dangerous situations in forest border area. Crop damage, Injury and loss of life of humans and wildlife are some of the impacts of human animal conflict. So there is a need to develop a system which detects the wild animal in forest border without causing any effect to human beings .Deep learning has developed as an effective machine learning method and application of deep learning has shown performance in different areas like image classification, segmentation and object detection. This paper analyses various methods of animal detection in images. A detailed survey on the methods of animal detection are performed in this paper.

Keywords: Animal Detection,   Deep Learning, Convolution Neural Network (CNN).

1. Introduction

Animal actions   can be described as in such a way that animals interact with each other, with other living beings, and with the environment. Animal Detection is a very significant and emerging field because of the vast number of real-life applications. The different applications track animals such as elephants, tigers, leopards to recognise their actions, preventing hazardous animals from entering residential areas. To show the presence of animals on roads and residential areas, different animal detection methods and alarm systems are used. Animal identification research in machine learning and image processing has been an important feature of different applications. CNN is a type of deep artificial neural feed-forward network that has been shown to be efficient in visual image analysis.

2.Animal Detection In Images

Investigates dependent on animal detection plays an exceptionally fundamental situation in numerous ongoing applications. Applications which are crucial are forestalling animal vehicle impact on roads, stopping risky animal interruption in private region, understanding locomotive behavioural of focused animal and plenty of more**.**India is mostly a farming-based nation wherein 70% level of people depends on horticulture, and 98% level of them rely on agriculture which are used Cows and buffaloes. Dog is valuable in Crime Investigation. Elephants are skins and tusks are useful for leather and ivory art works. Camels are utilized for transportation and entertainment. Wild animals like lion, tiger and leopards are assets of our country. Animal detection, recognition and tracking are most important task for recent years.

The challenges and difficulties of animal detection can be summarized as follows: Illumination changes: The detection will be particularly difficult when driving at night. Motion blur: The image captured by an on-board camera will become blurred due to the motion of the animal. Bad weather: In bad weathers, e.g., rainy and

snowy days, the image quality will be affected. Real-time detection: This is particularly important for autonomous driving.

2.1   Animal detection based on Viola Jones Face Detection Method

Researchers in[1] explained the approximate identification and observation of different animal faces with the use of Haar-like characteristics and Adaboost classifiers in order to identify or track animal behaviour and their interference with the environment. [2] Through the consolidation, description and inspection of animal faces in wildlife images, this paper focuses primarily on various animal behaviours. The strategy is based on the predominance of lion faces. Using Haar-like characteristics and AdaBoost classifiers, a human face technique is the subject of the detection process. Face tracking is carried out using a model of special interest that combines low-stage feature monitoring with the algorithm of detection. The precise and temporally coherent identification and monitoring of animal faces is carried out through the combination of the two mechanisms in the tracking system. The method which is used by the tracker is applied to different behaviours of animals.

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2.2 Animal Detection based on Template matching:

Template matching is a computer vision approach for recognizing small image regions that fit the patterns between the original image and the image of the template. In many applications, such as animal identification, animal tracking and animal detection, this method is used. [3] The improved template matching method for object detection was upgraded by the authors with combined spatial and orientation knowledge. For the estimation of the gradient, generalized distance transformation and orientation map methods are used. The work described objects such as people, maple leaves and cars from the images.[4] This work is centered around fast pattern matching that is utilized for wild animal hair identification. To develop FPMA, the traditional template matching approach is used based on normalized cross correlation (NCC) and convolution techniques. This strategy rotates noiseless images with radon functions and reference orientation

2.3 Animal Detection based on Machine Learning technique:

Animal Detection is a technology used to identify or detect animals using a digital image or a video frame from a video source. Collective strategies exist in which animal detection and recognition operates. The steps for animal behaviour and classification are shown in Fig 1 using machine learning techniques.
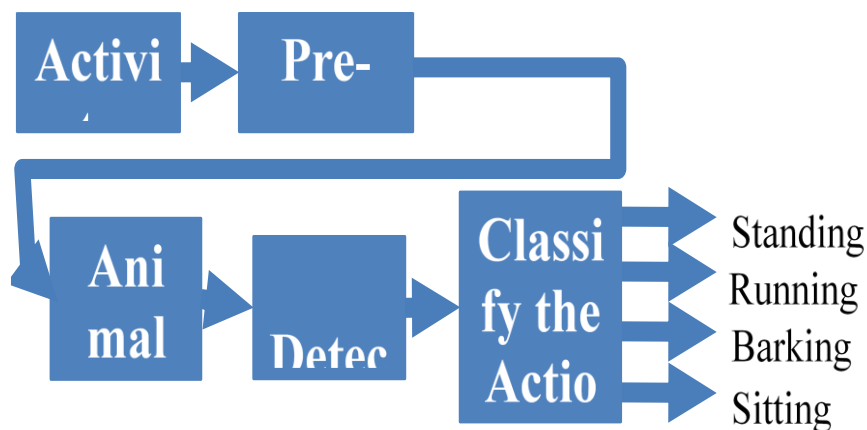
[5] This work focuses on animal behaviour and video sequence monitoring and is split into 200 frames for each video. HOOF characteristics are determined, SVM and KNN are used for actions like running, walking jumping resting for a specific animal for four different acts.[6] This paper describes the identification of human actions using hidden markov models and time sequential images are transformed into a vector sequence of image features and converted by vector quantization to symbol sequence

[7] Dua, Ishaetal has focused on how to detect elephants with help of video camera And the technique was useful to zones having high intervention of human beings and elephants. PHOG features and SVM classifiers are used[8] Mammeri, Abdelhamid, based on the process of animal detection, incorporates two criteria,

accuracy of recognition and speed of identification. Two-level system is used, LBP Adaboost calculation is used in the first level and HOG-SVM classifier is used in the second level. [9] This paper focused on how to detect student behaviour in the exam room. It uses an intelligent tracking system focused on surveillance monitoring system is used.Pattern matching and KNN classifier are used to detect behavior of students.

2.4 Animal Detection based on Deep Learning

 [10] This paper is centered around CNN to distinguish wild animals .Manually recognizing distinct animals is tough task so CNN model is utilized for animal identification and classification[11]The cameras has been utilized for security and surveillance has applications in various areas, as an example, air ports, parks, banks, stations and so forth to analyze actions This paper is projected on video illustration method by visual rhythm (VR) images which assessments the pixels of every frame into segment image to frame two dimensional image. The strategies had been tried in 8 public data bases, they may be SKIG, Dog Centric and JPL ,Weizmann, KTH, MuHAVi, UCF11 and HMDB51.

[12] The recognition of face framework includes face detection, extraction and feature categorization . This paper is focused around CNN technique and Random forest.[13] This paper focuses on the identification and monitoring of elephants in a wildlife video accumulated within the topic by scientists. A model of elephants from some of the training images is represented in the process. In view of the colour model, elephants are involved in video successions with different backgrounds and lighting conditions. The temporary recommendations are collected from the videos in order to increase the technique 's power and to gain spatial and temporal recognition.

[14] CNN technique is used to classify the animals and AlexNet is used to extract the characteristics and SV M classifier is used for classification.[15] This paper focuses on Boundry Sense Deep Learning architecture and this includes filtering module identifying raw image with object,/cropping module which separates object from background and DCNN module. [16] The Deep Convolutionary neural network-based species recognition algorithm is used for wild animal classification and image data is captured with motion-triggered images,camera traps and automatically segmented with state-of-the-art graph cut algorithm.

[17] In the academic environment, intelligent video monitoring systems based on IP cameras are used. The prim ary
use of this architecture is to supervise the safety of teachers and students, as well as to protect them from theft.T he
video surveillance framework involves measures such as environment modelling, moving object detection and c lassification ,region based ,contour based, model based and hybrid tracking algorithms from multiple cameras and tracking algorithms[19] Recognition of animal action relies on wearable sensors to collect data on animal postures processed by machine learning techniques and first-depth tracking used for animal detection

[20] G Ciaparrone provided a survey of the work to solve the MOT task on single-camera images, using deep learning models. Four phases are described in MOT algorithms.[21] This work focused on animal detection methodology in the images used by cameras mounted on roads, allowing regions and methods to be derived by features. [22]   In the areas like agriculture, airport and places nearby forest ,the animals destroy crops or they can attack on people so there is a need to detect animal presence and give warning about that in view of safety purpose. Deep neural networks are used for animal detection

[23] Manning, Timmy This work describes a faster R-CNN algorithm for object detection with VGG-16 as an extractor of features. Moving object detection is an initial step in approaches such as context subtraction, frame differentiation, temporal differentiation, optical flow and deep learning with machine learning.[24] This paper focuses on the paradigm of deep learning based object detection that addresses various problems such as occlusion, low resolution, clutter using R-CNN. This paper also reviews the three functions, such as object detection, face detection and pedestrian detection.[25] This paper discusses the cost-effective method of localization to reduce human-elephant encounters, and focuses on wild animal infrasonic emissions. SVM is used on ELOC nodes to detect elephant rumblings.

[26]   S. J. Sugumaretal This work focuses on the elephant image captured at the forest border and sent through the RF network to the base station.The image received is decomposed using Haar Wavelet and algorithms for extracting image features and image vision.[27] Sonia Jenifer Rayen Proposed a technique for detecting elephants in video processing and that work detects the elephants in wildlife Video input, video converted to image series, and colour are the five steps used in this work.

[28]   This work is focused on detection and image classification of animals and they have analyzed problems like detecting color appearances light conditions and variation in shape and CNN is used to detect

animals.

[29] This work is focused on Detecting methods of individuals dependent on video might be sorted as three procedures basically appearance based, motion based and hybrid based techniques . The various datasets used in this paper are the MIT Pedestrian Database, the USC Pedestrian Detection Test, the INRIA Person Dataset and the ETH Dataset CALTECH Database.[30] This paper focuses in particular on the sheep face dataset and the system that uses fine-tuning transfer learning for sheep image classification.[31] Sara C Keen This paper has proposed elephant name recognition which became inspected on 4000h of field recordings which become accumulated from 5 forest in Central Africa and recordings had been obtained in various seasons, years and weather conditions .

3. Datasets for animal detection

Table 1 shows the detailed survey of available animal datasets. This table shows the different types of animal classes in each dataset and number of images present in the dataset. Weblink also given in the table.

Table 1 .Animal datasets and its links

S.No	Dataset	Animals Classes	Images	Link
1	Cat-dog-horses-	Cat Dog Horses	612	https://www.kaggle.com/eabdul/dogs-cats-horses-humans-dataset
2	Jaguar-vs-leopard	Leopards, Jaguars	100	https://www.kaggle.com/edkahara/jaguar-vs-leopard
3	Animal-Image	Cats Dogs Pandas	3000	https://www.kaggle.com/ashishsaxena2209/animal-image-datasetdog-cat-and-panda
4	Animal Faces	Cats, Dogs, Wild Animals	16130	https://www.kaggle.com/andrewmvd/animal-faces

Table 2 shows the various techniques, animals used and accuracy for animal detection. In this table existing work has taken the duration of 2014-2020.

Table 2 Existing work of various techniques from 2014-2020

Year	Technique	Animals	Accuracy
2018	DCNN	Wild animals	91.4
2017	Computer vision	Elephant	98.6
2017	CNN	Animals	98
2013	Template matching	Dog	84.1
2015	SVM	Elephant	85.2
2014	K-NN	Wild animals	84.7
2020	CNN	Leopard	98.3
2019	CNN	Animals	94.1

4. Conclusion :

For an effective animal   identification algorithm there are additional issues to be considered to extend. In this paper, Review of novel techniques had been utilized for animal detection and distinct applications of animals are discussed. CNN classifies animals accurately with a magnificent scope of precision and furthermore the image of the identified animal is shown for a higher outcome so it might be utilized for different purposes which incorporate identifying wild animals moving into human living space and to forestall widely varied vegetation poaching or even human animal conflict. Several methods and algorithms are used in animal detection such as Detection and monitoring algorithm using KLT, HOOF, SVM, KNN, Prototype Matching CNN, YOLO as Convolution neural network is a powerful machine learning tool that is trained to concentrate on CNN using a wide set of diverse images as it achieves the best precision in detecting animal actions.

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