Wildlife Detection

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Abstract: In this paper, an ML-based system was built for the Detection of wild animals using images that have been captured with the help of a camera. The main purpose of this project is to reduce collisions between vehicles and animals on roads, such accidents resulting in ecological imbalance and large expenditures in public coffers. This paper presents the components of a simple animal detection system and also a methodology for animal detection in images provided by cameras installed on the roads. This method allows the feature extraction of the image and the use of Machine Learning techniques to classify the areas into animal classes. ML techniques were compared using synthetic images, traversing the pixels of the image using five distinctive approaches. Results show that the Support Vector Machine(SVM) identifies animals on roads accurately.

Keywords: Animal Detection, SVC ML Algorithm.

1. Introduction

Wildlife detection may be a vital and rising space because of an outsized variety of real-life applications. numerous life detection ways and warning systems square measure used for indicating the presence of animals on the roads, village farming, or residential areas. Applications that square measure vital in reality square measure preventing AN animal-vehicle collision on roads, preventing dangerous animal intrusion in a very dominion, knowing the locomotive behavior of targeted animals, etc. of these applications is reduced right down to 3 areas specifically detection, tracking, and identification of animals.

This model offers the anticipated animal image, animal name, and animal name invoice in order that the user will merely perceive and understand what precautions are taken in the future. Identification of animals is extremely necessary for distinguishing the targeted animal and its behavior. Identification of animals helps groups of people to observe and manage animals easier.

The ML model is discussed in this paper was trained using the SVM ML Algorithm. The dataset used in our project is labeling data. These are further discussed in detail in the following paper.

2. Literature Survey

Researches concerning animals in the image process are a vital field to several applications. several algorithms and strategies are developed by persons so as to own a much better understanding of animal behavior. Besides, these applications can also act as a warning system to persons from the intrusion of dangerous wild animals for early precaution measures. These applications are reduced right down to 3 vital branches, specifically detection, tracking, and identification of animals. the primary branch, within which animal detection, has been applied in numerous fields of real-life application. as an example, a detection algorithmic program has been developed for light-weight detection and locomote (LIDAR) knowledge to alter the fisher to seek outreach to the proper location of fishes within the deep sea. Researchers in used mobile remote sensing pictures to discover moving wild animals. Work in, on the opposite hand, used micro-Doppler signals to take care of human security by detecting potential dangerous animal intrusion to the territorial dominion. The second branch, that is animal chase, is that the main topic in watching animal locomotive behavior and its interaction with the setting. With the technology of detector, radio-frequency identification (RFID), and international positioning system (GPS), one in all the applications is that the development of recent zoological systems for animal traceability, identification, and anti-theft for the management and security of animal within the zoological garden [4]. By chase the animal moves, it helps persons to own a much better understanding of living creatures on earth, particularly on however the animal interacts with its setting. The third branch, that is animal identification, is employed to spot the detected wild animal. it's been employed in health watching systems for domestic collections. life animal care management becomes the most issue as animals have spectral. Work is found that the human observer won't opt to use this approach if they require to discover the animal.

3. Methodology

A. System Architecture

In this project, real-time detection of animal recognition ML model was built with the help of captured images.

This system was divided into three main phases; Initially, we wrote some code for the training of the whole dataset by implementing the SVM algorithm model. Preparing training data that takes all images into a list and also extracts features of all images into a list that are in the dataset. The list divides the data for training and testing. The data given to the model is labeled one. These labels are named in such a way that they express the name of the animal. Flatten function is used for converting a multi-dimensional array to a one-dimensional array and hog features are used for removing blur in images. The completion of training the model gives information about the number of animals the user has trained. The model trained for 30 different directories.

The testing begins by giving an input has an image to the model. About 30% of images are given for testing. The input is given to the testing model extracts the features and given to the SVC model. The model extracts the features of the image from the desired testing data.

In the prediction phase comparison of the trained input image and testing, image is done.The fig1 explains the architecture of wildlife detection.
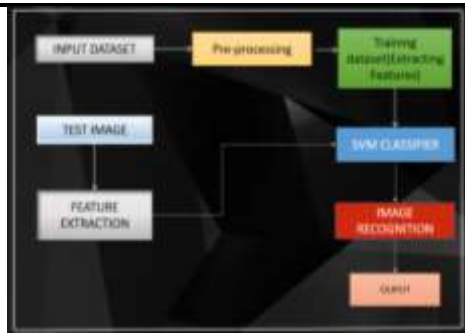
Fig1: System architecture

B. *Machine learning*

Support vector machines are a set of supervised learning methods used for classification, regression, and outliers detection. The motivation for this project was to develop a supervised machine learning model to identify an image of an animal. Support Vector Machine (SVM) was used to classify images for animal prediction. Classification SVM Type 1 (also known as C-SVM classification)is used in the project. Support Vector Classifier is the support vector machine algorithm for the multiclass problem. A Linear Support Vector Classifier is to fit the data you provide, returning the best fit hyperplane that divides or categorizes, our data. After getting the hyperplane, you can then have some features in your classifier to see what the predicted animal is. Linear Kernel is used when the data is linearly separable, that is, it can be separated using a line. It is the most common kernel to be used. It is mostly used when there are a large number of Features in an animal-N30 data Set. Training an SVM with a Linear Kernel is faster than with any other Kernel. In the project SVM use kernels they are linear, polynomial and Radial Basis Function. Radial Basis Function used for localization and finite responses across the range of real x-axis. The fig2 below explains the feature selection and kernels.
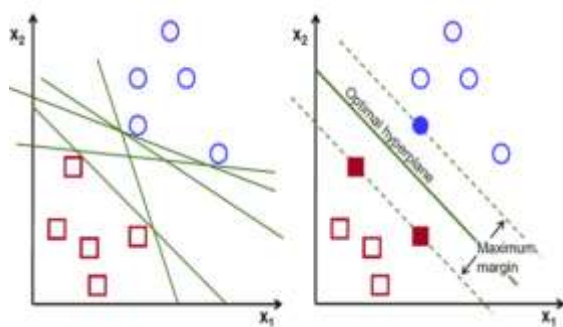

Fig2: SVM: Feature selection and kernels

Image manipulation with rgb2grey: RGB image has three channels they are red, green and blue but the grey scale image has only one channel. Image data is represented as a matrix, and the depth is the number of channels. Accordingly, the original color image has different dimensions but after calling "rgb2grey", the resulting greyscale image has only one channel, converting into one dimension. The below fig3 explains converting multi-dimensinal array into single dimensional array.

Fig3: Image manipulation

Histogram of oriented gradients: The images are converted into a format that SVM can understand. An image is divided in a grid fashion into the pixels within each cell, a histogram of gradient directions is compiled. To improve evenness to highlights and shadows in an image, pixels are blocked normalized. The HOG feature vector for the image is the sequence of those cell-level histograms.

Train model: To classify dataset– Support Vector Classifier (SVC), a type of SVM is used.

```
# define support vector classifier

svm = SVC(kernel='linear', probability=True, random_state=42)

# fit model

svm.fit(X_train, y_train)
```

C. *Flattening*

Flattening is the procedure for converting the two-dimensional array into a single-dimensional array, a long continuous linear vector. It receives the output from the list, flattens its structure to create a single, long feature vector to use the next layer for the final classification. This is shown in Fig 4 and Fig 5.
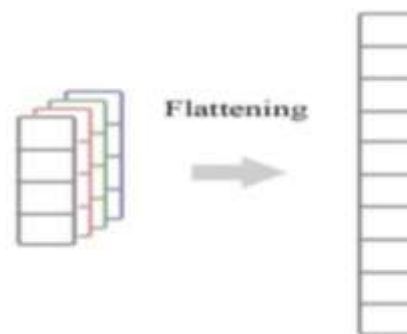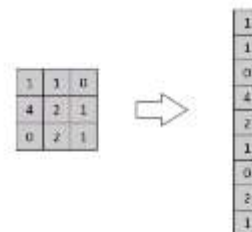

Fig. 4: Flattening

Fig. 5: Flattening

D. Dataset

Animal-N30 dataset has 4220 images. The N30 explains that it includes about 30 different animal directories. This dataset contains clear pictures of animals and each picture contains different pixels. The dataset is divided training and testing in the ration 70:30 respectively.

Fig. 2: Animal-N30 Dataset

a. Train Dataset

The percentage of images that were used for trained puroses in our project is seventy percent. Fig 3 and Fig 4 showing training images of dog and lion directories. The two directories are among the 30 directories of the animal-n30 dataset. We can observe Fig 3 having different images of Dog expressing in different ways. A single image is different from other images.

Dog Train Dataset

Fig. 3: Dog Train Dataset

Lion Train Dataset

We can observe Fig 4 having different images   of Lion expressing in different ways. A single   image   of Lion is different from other images.

Fig. 4: Lion Train Dataset

b. Test Dataset

The percentage of images that were used for testing purposes in our project is thirty percent. Fig5 and Fig 6 showing testing images of dog and lion directories. The two directories are among the 30 directories of the animal-n30 dataset. We can observe Fig 5 having different images of Dog expressing in different ways. A single image is different from other images.

Dog Train Dataset

Fig. 5: Dog Test Dataset

Lion Train Dataset

We can observe Fig 6 having different images   of Lion expressing in different ways. A single   image   of Lion is different from other images.

Fig. 6: Lion Test Dataset

4. Results and Discussions

Detection of wildlife animals with an SVM algorithm using captured images from a camera was introduced. In this paper, users can recognize animal names, take precautions for future use, and be safe. This system showed good results by taking advantage of machine learning techniques. This section discusses the results obtained by the system. Fig 7 shows the user's welcome and login page. The user after entering login credentials then he can directly go to the main page.

Fig. 7: Welcome Page and Login Page

Fig 8 shows the main page of the project. User can continue the execution from training the data to predicting the data.

Whenever the user clicks the training button it prompts to select the dataset from his storage. After completion of training, the user can select the testing button it prompts to select a testing image from the storage. Finally selecting the prediction button shows the final results of the project.
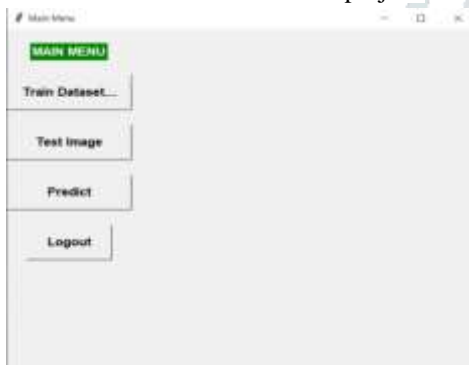

Fig. 8: Main Page

Whenever the user selects the prediction button after training and testing it shows the results Fig 9 shows the results of the identification of an animal. It also shows the animal name in the window.
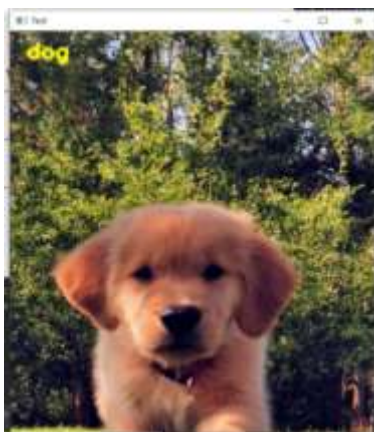

Fig. 9: Animal Identification

Apart from the above information 4220 images were trained and real time images were tested and got the result. The results have shown up to average accuracy of 85%.

5. Conclusion

In this paper, a real-time ML-based Wildlife Detection was built using images that were taken with the help of a camera. Images were built to contain different types of features for example containing different pixels, different angle of images means image containing only face or complete body animal image, etc. The projected system is real-time animal detection. it might notice the animals within the wild and alerts the authorities. It will solve all the issues of the prevailing system and that we believe that this projected system are hand in life observance.

In addition, there is a lot of scope for this, project, since we have label images.

6. References

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