Detection Of Wild animals using image processing and PIR Sensor

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Abstract: One such significant problem that results in fatalitieson both sides is the battle between wild animals and common people. This study employs an animal detecting technology to see the stray animals that are entering a field.The technology is set up to constantly monitor the field for the presence of any animals. In this project, animal movement is detected using IR sensors and ultrasonic sensors, which then provide a signal to thecontroller.This is mainly used to protect the animals from dangerposed by humans.The whole structure of the Image processing is detecting the images which enter the field and starts to capture the image and starts analysing with the data set stored in the cloud platform. Once analysed it will detect whether the given image is wild animal or not using search grid method due to its accuracy in this method, once it find the image captured is the wild animal then the algorithm will send the signal to the arduinowhere it generates the particular frequency which irritates the animal and emmits the frequency using PIR sensor. This type of IOT is used mainly in agriculture and forest areas where people live near forest and travel through forest roads. It wont physically affects the animals nor humans. This will save many animals from accident on forest road.

Keywords:PIR sensor,camera,Image processing,Noise genera- tor,animal detection

I. INTRODUCTION

Image Processing is a method for performing certain actionson a picture to produce an improved image or to extract some useful information from it. It is a type of sign processing wherethe input is a photo and the result might be associated picture highlights.

Image Processing is one of the fast evolving technologiesof today. It also structures the centre examination region within the fields of software engineering and design. Image Processing essentially consists of the following three steps:

1. importing the image using picture security tools. 2.manipulating and analysing the image. 3. output from which the outcome may differ in the form of a report or updated image.

Benefits: Image processing technology can replace manual efforts and it helps humans to save time from watching animalsto enter into their personal space. Using frequency generator does not affect humans as it is possible that they can't hear thefrequency which most of the animals can hear. This technologyis Eco-friendly and it does not physically affect animals and humans. Forest areas - Using this technology we will be able tokeep animals away from roads in forest areas when people are travelling and also keeps animals safe this way from accidents.It can also be used to save people who reside in the forest by repelling the animals away. By keeping animals safe it also helps to nurture forest.

Agriculture - This technology is very useful to the farmers because it helps to keep their crops safe from animals.Thus it can help the farmers in producing more yield which in turn helps them gain more profit.It also saves human life from dangerous animals while they work in fields. This technology can safeguard animals from high voltage fences which can hurt animals physically.

we can carry out this process by first identifying what animal to repel. Then database access to find out the range of hearing of that particular animal. Then using

II. LITERATURE SURVEY

Researches on Animal Detection by Human Eyes

Early investigates on creature location are to see the way that quick natural eyes can identify the presence of creature in regular scene.[1] Creature recognition by natural eyes has beenthought of as the most dependable location strategy whenever seen according to the computational perspective. This is since the picture structure in normal pictures is complicated. it is tracked down that a human spectator can conclude whether a momentarily streaked creature scene contain a creature as quick as 150ms. middle response time results demonstrate a speed precision of 92 percents for response season of 390ms and increment to 97 percent of accuracy for 570ms. However human discovery is compelling and accomplish palatable level,natural eyes can undoubtedly get drained causing diminishing of viability. Besides, natural eyes can't work 24 hours every day to perform creature location. These blemishes can be checked by applying PC vision in picture handling for creaturediscovery

Researches on Power Spectral The specialists additionally have attempted to find whether the of creature in the picture scene will change the power ghastly of the picture or not.[2] The power ghastly can be characterized as the adequacy of the sign in the recurrence area. This can be developed by changing the pictures from spatial area into the recurrence space, by utilizing change capability, for example, the Fourier change. The primary thought is to assist the human spectator with understanding the presence of the creature in the scene by assessing the power unearthly.

Animal Detection using face Detection Approach

For research in regards to train conduct of wild creature, strategy consolidating identification furthermore, following of designated creature faces has been applied utilizing Haar- like element and Adaboost classifiers. The video recordersis possibly turn on when positive designated creature been recognized to draw out battery duration time and to guarantee recorded video contain research esteem.[3] This strategy par- ticularly essential in circumstance by which video man isn't appropriate to introduce at the recording scene for security issue or video man could drive away some hesitant creature away. The creature faces are estimated by using face identifi- cation technique with various nearby differentiation setup of radiance channel to recognize the picture locale of

creature faces distinguishing the presence of creature interruption. Also, luminance issue with changes of regular climate from day to night at open air observation framework can likewise influence the identification. Moreover, moving foundation, forexample, leaves by wind may be viewed as frontal area pictureand some idle creature which stay static for quite a whilecan be erroneously deciphered as foundation picture by the calculations.

Animal Detection Based on Thresholding Segmentation Method

Target extraction from foundation can be performed by utilizing edge division strategy. the item is found by utilizing foundation deduction technique subsequent to getting the foundation picture. The edge division technique in light of the pixel values is performed[4]. Nonetheless, in this method, specialists ought to painstakingly pick the limit esteem as they likewise ought to consider the negative worth got at specific pixel point by direct deduction. The possibility of edge division is straightforward, which pixel of dim that more noteworthy than edge are set to white and those not exactly theedge worth will be set to dark . It is challenging to choose the limit precisely as the foundation picture occasionally changes. Along these lines, different suitable edge ought to be picked for various foundation scene.

Animal Detection Using Template Matching Algorithm

Moving Item Discovery Procedures Distinguishing moving items from a video succession is a essential and basic errand in numerous PC vision applications. A typical methodology is to perform foundation deduction, which distinguishes mov- ing items from the part of a video outline that contrasts fundamentally from a foundation model There are follow- ing challenges in fostering a decent foundation deduction calculation. It should be vigorous against changes in light.It ought to try not to identify non-fixed foundation articles, for example, moving leaves, downpour, snow, and shadows cast by moving articles.[5] Its inside foundation model ought to respond rapidly to changes in foundation, for example, beginning and halting of vehicles Along these lines, in the wake of doing overview of casing differencing, mean strategy,standard deviation and combination of Gaussian technique, we have inferred that outline differencing performs nearly better than some other instrument. This technique functions admirably regardless of whether there is change in foundation like moving leaves, falling came down.

A Self-Organizing Approach to Background Subtraction forVisual Surveillance Applications

Discovery of moving articles in video transfers is the pri- mary important stage of data extraction in numerous PC visionapplications. Beside the natural handiness of having the optionto portion video transfers into moving and foundation parts, distinguishing moving items gives a focal point of thought- fulness regarding acknowledgment, order, and movement in- vestigation, making these later advances more productive. We propose a methodology in light of self association through fake brain organizations, broadly applied in picture handling frameworks also, more by and large in mental science.[6] The proposed approach can deal with scenes containing moving foundations, continuous light varieties and disguise, has no bootstrapping limits, can incorporate away from plain sight model shadows cast by moving protests, and accomplishes vig-orous identification for various kinds of recordings taken with fixed cameras. We contrast our strategy and other displaying procedures and report test results, both concerning recognitionexactness and with regards to handling speed, for variety videogroupings that address average circumstances basic for video reconnaissance frameworks

Intelligent System for Detection of Wild Animals Using HOG and CNN in Automobile Applications

Roadkill, also known as animal vehicle collision, is a growing concern to both people and wild animals, with an increase in fatalities every year. Animal behaviour (such as deer) on roads is unpredictable and chaotic, contributing to vehicle collisions. The use of infrared image processing over a camera car mount in the vehicle in this article reveals a newer dimension for wild animals' auto-detection during active nocturnal hours.[7]

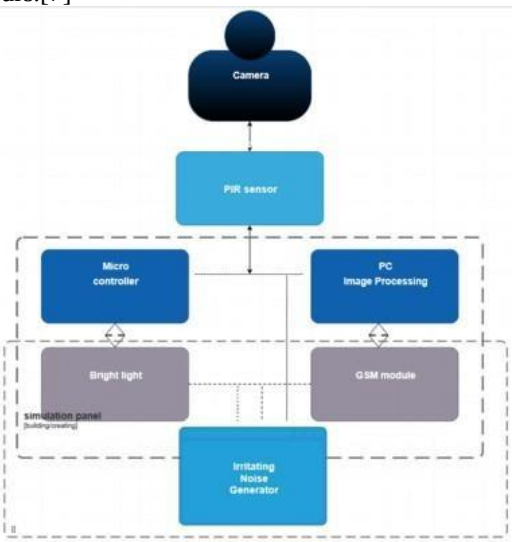


Fig. 1. component architecture

III. REQUIREMENT ANALYSIS

A. Functional Requirements

There are general stage in creature discovery and acknowl- edgment framework and these structure the utilitarian prereq- uisites of this framework. The framework should execute all the useful necessity before we at long last get into the normal outcome. The necessities are as per the following.

Capturing of the image: This is one of the main requirementand the function of this phase is to determine where in an image a animal is located.

Animal Detection: The process of detecting animals in-volves examining a picture at various zoom levels while looking for a few basic patterns that indicate the presence of ananimal. once an animal is detected by the system. The Haar- based Cascade Classifier. This method, known as a classifier, examines a picture and generates a bounding box as a result for each animal it detects.

Feature Extraction: The following stage is feature extractionwhen the animal has been located. Animal characteristics are developed and extracted using effective algorithms, and certain changes are made to the current method models.. This is a phase where the system does the localizing of the characteristics of components in an image. In other words, feature extraction is a step in animal recognition where the system locates certain points on the animal.

Declare Matches:The greatest matching score obtained in the preceding stage must be declared as the final functional criterion for face recognition. Features are taken from an animal and processed, then they are compared to similarly processed animals in the database. An animal is known if it can be identified; otherwise, it is unknown. As a result, the system will identify the appropriate animal. *Non Functional Requirements*

Performance: The captured image must detect the facewithin 3 seconds.

Reliability: The system does not depend on any otherexternal services; hence the system is expected to be reliable.

Maintainability: Since we are using the Pycharm IDE tosupport, our application is easier for maintenance.

Software Requirements Operating System : WindowsLanguage : Python

IDE : PyCharm

Hardware Requirements Processor : Any Processor above500 MHz.

Ram : 2 Gb.

Hard Disk : 10 Gb. Compact Disk : 650 Mb

IV. IMPLEMENTATION

DATA SET

The standard data set is not available for animals. We have collected 500 images for single class. The images are downloaded from internet. Here datasets contains the side viewimages of the selective animals. We cropped the animal in the image. The cropped image is in ratio 8:4. All the images are resized, where image size is reduced. The image size reductionis done before training phase image quality should be reduced from high quality image to low quality because the animal can be detected even in low quality video clip. Performance is more when there are more images in datasets for trainingand testing.

DETECTION

Features are operations on the primary measurement vari- ables that aid in pattern or categorization recognition. The pro-cess of selecting a collection of features, or picture qualities, that will most effectively or meaningfully represent the data required for detection, analysis, and classification is knownas features extraction. The goal of features extraction is to improve object identification and classification's efficacy and efficiency.

HAAR-LIKE FEATURES Traditional digital picture char- acteristics used in object detection are called Haar-like features(or Haar features). These two-dimensional Haar functions, which may be used to represent the local appearance of objects, are an excessively full collection.

FEATURE EXTRACTION

SURF-Speed up robust features It is a descriptor and featuredetector that may be used for applications like object identi- fication, image registering, classifying, or building in three dimensions. It bases its feature descriptor on the sum of haar. wavelet response at the interest point.

There are three primary sections. *Detection of interest points *Neighborhood description in your area *Matching To locate a location of interest, SURF utilises a blob detector based on a hessian matrix.

SUPERVISED LEARNING

SURF-Speed up strong characteristics The merits and pit- falls of supervised machine learning methods are discussedin this chapter. The three supervised learning techniques covered in this chapter are artificial neural networks with backpropagation, support vector machines, and adaptive boosting.

MACHINE LEARNING: ALGORITHMS TYPES

Managed realizing: where the calculation produces a capa- bility that guides contributions to wanted yields. One standard plan of the regulated learning task is the arrangement issue: the student is expected to a capability which maps a vector into one of a few classes by checking out at a few information yield instances of the capability.

- Unsupervised learning: which models a bunch of data sources: marked models are not accessible.
- Semi-supervised learning: which consolidates both namedand unlabeled guides to produce a proper capability or classi- fier.
- Reinforcement learning: when the calculation picks up a tactic on how to behave appropriately given a worldview. Eachaction influences the climate in some way, and the climate provides information that guides the learning calculation.
- Transduction: like directed learning, yet doesn't unequiv- ocally build a capability:all things being equal, attempts to anticipate new results in view of preparing inputs, preparing yields, and new inputs.
- Learning to learn: when the computation develops its own inductive leaning based on prior knowledge. Supervised learning is very common in characterisation problems becausethe goal is typically to get the PC acquainted with a frameworkfor character characterisation that we have created. the mostof the time, Any problem where determining an order is necessary lends itself to characterisation learning. beneficial, and choosing the categorization is not hard. Regulated movingforward usually abandons the Indistinct probability for inputs Because the information sources are readily available, this approach is not necessary for as long. Nevertheless, it would be absurd to infer anything about outputs if some of the info values were absent.

Support Vector Machine

The concept of decision hyper planes, which provide decision boundaries in input space or high-dimensional feature space, is the

foundation of Support Vector Machines (SVMs) categorization.

Both a training step and a testing stage are necessary when creating an image recognition system . The recognition framework's parameters are learned from training photos that have already been manually tagged during this stage . The trained framework receives input from incoming images and generates a label prediction during the testing phase.

CNN ALGORITHM:

Separate procedures for feature extraction and classification are used in conventional image recognition frameworks. However, CNNs develop a classifier automatically after learning the picture information. In this sense, CNNs could be compared to a "black box" that creates an automatic mapping link between the input image and the output label. Inside the "black box," there are many levels resembling neural networks, where each component is thoughtof as a neuron and each neuron in the current layer is fully connected to neurons in the subsequent layer.

Data is passed from the current layer to the following layer, and the final layer is directly connected to the output label. Convolutional layers (C), pooling layers (P), and fully linked layers make up the majority of a typical CNN architecture.

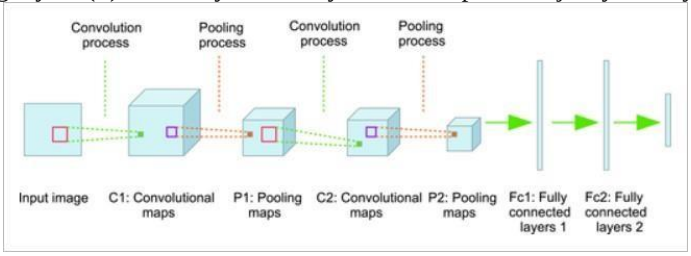


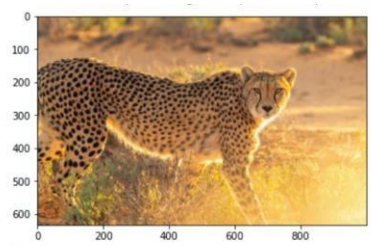
Fig. 2. CNN layers

Different convolutional maps make up a convolutional layer.Convolution is a stage in image processing when feature mapsare combined with various kernels, or what are known as filters

. Numerous separate pooling maps make up a pooling layer. Convolutional layers are frequently subjected to a pooling technique. The pooling procedure can be thought of as a downsampling stage because it reduces the size of the input feature maps. Both of these processes are repeated,. Although it is not required and other CNN structures are valid, in this picture a pooling operation is always performed after a convolutional procedure.

Studies have demonstrated that CNNs trained on a sizable source domain dataset can be successfully moved to a new target domain.The already trained weights are employed as the initial weights in this transfer learning procedure, and the task dataset is then used to fine-tune them. It is assumed that since the network has already picked up relevant information, it will be more accurate than a model trained on a smaller dataset.

V. RESULTS

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Cheetah = 23.237879581592424%
Jaguar = 16.647895106911434%
Leopard = 18.949003691991116%
Lion = 19.39480418081O823%
Tiger = 21.77041743869423%
The predicted image is : Cheetah
The detected animal is danger and signal is sent to reciever
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Fig. 3. Accuracy using cnn

	Test data						Accuracy (%)	Mean accuracy (%)
	Badger	Bird	Cat	Fox	Rat	Rabbit		
Prediction								
Badger	395	2	6	29	9	6	83.07	79.98
Bird	1	441	3	7	2	4		
Cat	4	3	207	34	10	6		
Fox	54	11	90	704	24	46		
Rat	7	0	5	3	122	3		
Rabbit	6	1	14	31	4	214		
Individual accuracy (%)	84.58	96.29	63.69	87.13	71.35	76.87		

Fig. 4. Results

To assess performance, the accuracy and mean accuracy were employed. The accuracy values from the various cate- gories were averaged to get the mean accuracy. Since mean accuracy offers a less skewed measurement than accuracywhen the dataset is unbalanced, we employ it. A random test image is more likely to be assigned to a larger group during the training stage when utilising an unbalanced dataset becausethe weights may be skewed toward larger groups.

$$\text{Accuracy} = \frac{TP + TN}{TP + FP + FN + TN}$$

$$\text{F1 score} = \frac{2TP}{2TP + FP + FN}$$

Fig. 5. calculation formulas

We will classify video footage using the trained CNN. In this procedure, the mean variation of pixel values is calculatedby comparing neighbouring frames.Any frame with an averagevariation higher than this threshold was sent for classification. The false-positive and false-negative rate are affected by the threshold value. For instance, a high threshold would only pickup animals when they make noticeable movements, but a low threshold would lead to creatures being wrongly detected as minute background movements.

Theoretical Results: After running the image processingalgorithm we need to find the range of hearing of the identifiedanimal Each species of animal has a different range of hearingTo generate this kind of sound we will use Ultrasonic animal repellers. Ultrasonic animal repellents are loudspeakers thatemit various sound frequencies based on the type of animalthey are intended to deter. These devices use high frequency

Estimated Range of Hearing Frequency of Species

Species	Approximate Range (Hz)
Human	64–23,000
Dog	67–45,000
Cat	45–64,000
Cow	23–35,000
Horse	55–33,500
Sheep	100–30,000
Civet	16–44,000

Fig. 6. frequency table

audible sound waves in addition to ”genuine” ultrasounds, which are theoretically inaudible to humans. In some cir- cumstances, the user can modify the frequency based on the device’s type and the types of animals it repels.

Recommendations for Installing the device correctly If the ultrasonic animal repeller’s frequency can be altered, pickinga higher frequency would be beneficial. However, this might lessen the signal’s ability to repel some animal species. Re- member that hearing sensitivity differs between children and adults; as we age, our sensitivity to high tones decreases. Additionally, people of the same age have different levels of sensitivity. Correctly positioning the equipment is also crucial

VI. FLOWCHART

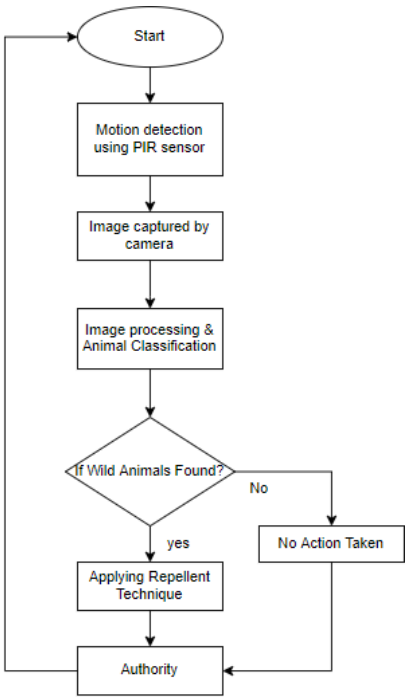

Fig. 7. Implementation Model

VII. CONCLUSION

The animals, huge quantities of which are at this point split the difference or risked, are generally speaking killed in backlash or to prevent future battles. So the zone is to check tirelessly to through section of wild animals. Concerning this

issue, we have attempted to cultivate the structure which will screen the field using sensor and camera and got image of the intruder will be assembled using picture dealing with so proper move can be made. The CNN AI innovation, which is entirely dependent on learning new highlights that have been enhanced with HOG highlight detection in symbols and natural life identification and order, yields effective and impressive results. By combining CNN and HOG, the highest degree of accuracy achievable was obtained for this study project. The issue arrangement obtained by emphasising the results in light of only CNN symbolism components will result in very little picture discovery. Taking the HOG change into consideration alone without doing any preprocessing on warm images may commonly lead to overfitting errors. The accuracy obtainedby the persuading use of computer vision and AI is 91. Thus using this technology which won't affect animals or humans physically and it is eco-friendly to nature.

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