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ANIMAL RECOGNITION SYSTEM IN RANCH AREAS

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Abstract: Researches about animals in image processing have been a main field to several applications. A lot of algorithms and methods have been residential by human being in order to have a better thoughtful on animal activities. These applications can be lessened down to three main branches, namely detection, tracking and identification of animal. The first division, which is the animal detection, has been applied in various fields of real life application. The second branch, which is the animal tracking, is the main topic in monitor animal locomotive performance and its communication with the environment. With the technology one of the applications is the development of new zoological systems for animal trace capacity, recognition, and anti-theft for the management and security of animal in zoo. By tracking the animal movements, it helps human to have a better accepting on living creatures on earth, mainly on how the animal interact with its environment.

I. INTRODUCTION

India is an agricultural country. Agriculture has always been India's most important economic sector. Though most of the India's population depends on agriculture, there are still a lot many problems faced by farmers. Human animal conflict is a major problem where enormous amount of resources is lost and human life is in danger. In recent times the numbers of these kinds of conflicts are increasing. Elephants or wild boar tramp the vegetation in farm land in need of nutritious food. Usually farms are protected with electrical fence; animal which tries to enter the field suffers electrocution with intense pain cause animals to behave in abnormal manner. In this paper, the animals many of which are already threatened or endangered are often killed in retaliation or to prevent future conflicts.[1] An efficient automatic animal detection and a warning system can help drivers in reducing the number of collisions occurring between the animal and the vehicle on roads and highways. animal detection based on HOG and cascade classifier. The algorithm can detect an animal in different conditions on highways. Estimation of approximate animal distance from the testing vehicle is also done. This method can easily be extended for detection of other animals too after proper training and testing. [2]**.** The problem of damaging crops by wild animals has become a major social problem in the current time. It requires urgent attention and an effective solution. Future scope in this project is to detect the location of the animals by using RFID injector and GPS. [3] The proposed solution for wildlife alert system presents cost-effective, reliable and technically simple solution. This approach believes that using various such IOT devices the environmental balance can be achieved by saving the wild animals from getting harmed. We can come up with more advanced approaches to completely avoid the wild animals from leaving forest boundaries using safer methods than electrical fence. [4] They selected to be conservative and limited our endeavour to only three kinds of animals. For the feature extraction we used several descriptors like Color layout descriptor (CLD), Color structure descriptor (CSD), Edge histogram descriptor (EHD), Homogeneous texture descriptor (HTD), Region shape, Contour shape. Using these descriptors, research was carried out about how the individual descriptors perform and the performances of combined descriptors. [5]

II. PROPOSED SYSTEM

In this paper, background subtraction method is used for detecting the animal. For implementation of this proposed method we have used region props algorithm. This particular technique is used to separate the object from the image. Whereas, object shaping is identified using blob method. This method is general and fastest technique in machine vision used for identifying the image region. For extracting the targeted animal's details from background, this approach

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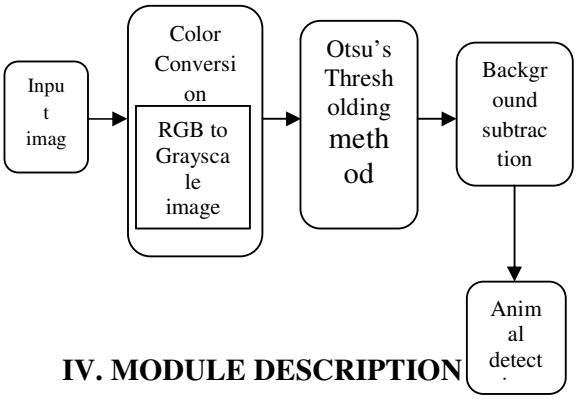
can be used. The basic idea of this approach is simple in which the pixels in the image having intensities or values greater than the threshold are set to white (i.e. intensity 255) and those pixels having intensities or values less than the threshold value are set to black (i.e. intensity 0). There are different types of thresholding like adaptive thresholding or dynamic thresholding and optimal thresholding which are very important topics image processing but in this project we will restrict to simple concept of Otsu's thresholding only.

III. BLOCK DIAGRAM



IV. MODULE DESCRIPTION

Image acquisition

The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. In the present scenario images have become the most suitable way to keep our past alive. Nowadays people are very busy in earning their livelihood and day to day life, even though they want to keep their golden moment alive for the rest of life. Images have touched almost all the fields like medical, sports, social networking and many more. It is the need of time to know how the images are being captured and stored into memory. To deal with images and before analyzing them the most important thing is to capture the image. This is called as Image Acquisition. Image Acquisition is achieved by suitable camera. We use different cameras for different application. If we need an X-Ray image, we use a camera (film) which is sensitive to X Rays. It is the first step in the workflow sequence because, without an image, no processing is possible. Image acquisition is the process of retrieving retinal images from human body by using the X-ray, MRI tomography or digital camera for detect the disease. This image can be acquired from that and it will interface with MATLAB. Then the image has been detecting the retinal vessel after that optic disc and cup will be detected. This image can be acquired from that and it will interface with MATLAB.

Colour conversion:

Conversion of a color image into a gray scale image inclusive of salient features is a complicated process. The converted gray scale image may lose contrasts, sharpness, shadow, and structure of the color image. To preserve contrasts, sharpness, shadow, and structure of the color image a new algorithm has proposed. To convert the color image into gray scale image the new algorithm performs RGB approximation, reduction, and addition of chrominance and luminance. The grayscale images generated using the algorithm in the experiment confirms that the algorithm has preserved the salient features of the color image such as contrasts, sharpness, shadow, and image structure.Color conversion is the process of convert the image in to required color pattern. Which is depends on the process we are using. In this we are converting the RGB images into gray image. Because of the large computational complexity RGB image cannot be processed. And if we use RGB image for further processing we need separate filter functions for each color values. Which increase number of coding lines. So we use color conversion process for convert RGB image into gray level image. This leads to process the easier.

Filtering:

Image filtering is useful for many applications, including smoothing, sharpening, removing noise, and edge detection. A filter is defined by a kernel, which is a small array applied to each pixel and its neighbours within an image. In most applications, the center of the kernel is aligned with the current pixel, and is a square with an odd number (3, 5, 7, etc.) of elements in each dimension. The process used to apply filters to an image is known as convolution, and may be applied in either the spatial or frequency domain. See Overview of Transforming between Image Domains for more information on image domains. Filtering is a technique for modify an image. For example, you can filter an image to emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing, sharpening, and edge enhancement. Filtering is the process of removing the noise in the image. While image acquisition because of the environmental factors, the noise will be added in the image and image quality will be reduced. To improve the image quality we use different types of filter based on

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application. Here we use the median and wiener filter. These two filters are most commonly used filter for removing noise.

Contrast enhancement:

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features. Image enhancement techniques have been widely used in many applications of image processing where the subjective quality of images is important for human interpretation. Contrast is an important factor in any subjective evaluation of image quality. Contrast is created by the difference in luminance reflected from two adjacent surfaces. In other words, contrast is the difference in visual properties that makes an object distinguishable from other objects and the background. In visual perception, contrast is determined by the difference in the colour and brightness of the object with other objects. Our visual system is more sensitive to contrast than absolute luminance; therefore, we can perceive the world similarly regardless of the considerable changes in illumination conditions. Many algorithms for accomplishing contrast enhancement have been developed and applied to problems in image processing.In this lecture we will talk about contrast enhancement. Linear and non-linear transformation functions such as image negatives, logarithmic transformations, power-law transformations, and piecewise linear transformations will be discussed. Histogram process and histogram of four basic grey-level characteristics will be introduced

Segmentation:

Image segmentation is the process of dividing an image into multiple parts. This is typically used to identify objects or other relevant information in digital images. There are many different ways to perform image segmentation.If an image has been preprocessed appropriately to remove noise and artifacts, segmentation is often the key step in interpreting the image. Image segmentation is a process in which regions or features sharing similar characteristics are identified and grouped together. Image segmentation may use statistical classification, thresholding, edge detection, region detection, or any combination of these techniques. The output of the segmentation step is usually a set of classified elements, Segmentation techniques are either region-based or edge-based. Region-based techniques rely on common patterns in intensity values within a cluster of neighbouring pixels. The cluster is referred to as the region, and the goal of the segmentation algorithm is to group regions according to their anatomical or functional roles. Edge-based techniques rely on discontinuities in image values between distinct regions, and the goal of the segmentation algorithm is to accurately demarcate the boundary separating these regions. Segmentation is a process of extracting and representing information from an image is to group pixels together into regions of similarity. Region-based segmentation methods attempt to partition or group regions according to common image properties.

Feature extraction:

Feature plays a very important role in the area of image processing. Before getting features, various image preprocessing techniques like binarization, thresholding, resizing, normalization etc. are applied on the sampled image. After that, feature extraction techniques are applied to get features that will be useful in classifying and recognition of images. Feature extraction techniques are helpful in various image processing applications e.g. character recognition. As features define the behaviour of an image, they show its place in terms of storage taken, efficiency in classification and obviously in time consumption also. Hereby in this paper, we are going to refer features and feature extraction methods in case of character recognition application.Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval. Feature detection, feature extraction, and matching are often combined to solve common computer vision problems such as object detection and recognition, content-based image retrieval, face detection and recognition, and texture classification.

Image thresholding

Thresholding is a image processing method used to convert a grey scale image (value of pixels ranging from 0-255) into binary image (value of pixels can have only 2 values: 0 or 1). Thresholding techniques are mainly used in segmentation The simplest thresholding methods replace each pixel in an image with a black pixel if the pixel intensity is less than some fixed constant T, else it is replace

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with a white pixel. Thresholding is an important technique in image segmentation applications. The basic idea of thresholding is to select an optimal gray-level threshold value for separating objects of interest in an image from the background based on their gray-level distribution. While humans can easily differentiable an object from complex background and image thresholding is a difficult task to separate them. The gray-level histogram of an image is usually considered as efficient tools for development of image thresholding algorithms. Thresholding creates binary images from grey-level ones by turning all pixels below some threshold to zero and all pixels about that threshold to one.

OTSU thresholding:

This method is named after its inventor Nobuyuki Otsu and is one of the many binarization algorithm. The post here will describe how the algorithm works and C++ implementation of algorithm. Open CV has in-built implementation of OTSU thresholding technique which can be used.

The algorithm assumes that the image contains two classes of pixels following bi-modal histogram (foreground pixels and background pixels), it then calculates the optimum threshold separating the two classes so that their combined spread (intra-class variance) is minimal, or equivalently (because the sum of pair wise squared distances is constant), so that their inter-class variance is maximal. Consequently, Otsu's method is roughly a one-dimensional, discrete analog of Fisher's Discriminant Analysis. Otsu's thresholding method involves iterating through all the possible threshold values and calculating a measure of spread for the pixel levels each side of the threshold, i.e. the pixels that either fall in foreground or background. The aim is to find the threshold value where the sum of foreground and background spreads is at its minimum.

Otsu's method is a global thresholding technique. It uses the histogram of the image for threshold searching process. It maximizes "between class variance" of the segmented.

Background subtraction

Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. The rationale in the approach is that of detecting the moving objects from the difference between the current frame and a reference frame, often called "background image", or "background model.

Background subtraction is process of extracting foreground objects from maintained background model. A foreground object is any entity that detected by producing difference of the every frame of sequence to background model. This result can be further used for tracking targets, motion detection. Background subtraction further divides into parametric and non-parametric background subtraction. There are different background subtractions techniques have been proposed in literature. The background model can be static or dynamic. The flowchart for Background subtraction is shown in figure 4. Dynamic background model is one in which the background of scene may contain moving objects in outdoor environment, Pixel-based and block based are two major kind of approached are for background Subtraction.

V. DERIVATION OF THE GENERIC LBP OPERATOR

LBP using 8 pixels in a 3 × 3 pixel block, this generic formulation of the operator puts no limitations to the size of the neighbourhood or to the number of sampling points. Consider a monochrome image I (x, y) and let gc denote the gray level of an arbitrary pixel

(x, y), i.e. gc = I (x, y).

Moreover, let gp denote the gray value of a sampling point in an evenly spacedcircular neighbourhood of P sampling points and radius R around point (x, y):

gp = I (xp, yp), p = 0, . . . , P − 1 and (2.1)

xp = x +R cos(2πp/P), (2.2)

yp = y −R sin(2πp/P). (2.3)

Assuming that the local texture of the image I (x, y) is characterized by the joint distribution of gray values of P +1 (P > 0) pixels:

T = t (gc, g0, g1, . . . , gP−1). (2.4)

Without loss of information, the center pixel value can be subtracted from the neighbourhood:

T = t (gc,g0 −gc,g1 − gc, . . . , gP−1 −gc). (2.5)

In the next step the joint distribution is approximated by assuming the center pixel to be statistically independent of the differences, which allows for factorization of the distribution:

T ≈ t (gc)t (g0 −gc,g1 − gc, . . . , gP−1 −gc). (2.6)

Now the first factor t (gc) is the intensity distribution over I (x, y). From the point of view of analyzing local textural patterns, it contains no

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useful information. Instead The joint distribution of differences

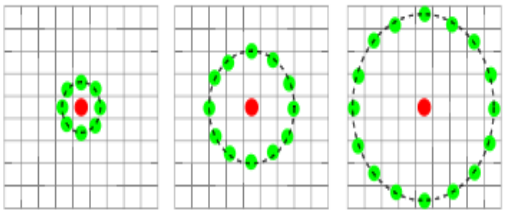
t (g0 – gc,g1 –gc, . . . , gP–1 –gc) (2.7)

can be used to model the local texture. However, reliable estimation of this multidimensional distribution from image data can be difficult. One solution to this problem, proposed by Ojala et al, is to apply vector quantization. They used learning vector quantization with a codebook of 384 code words to reduce the dimensionality of the high dimensional feature space. The indices of the 384 code words correspond to the 384 bins in the histogram. Thus, this powerful operator based on signed gray-level differences can be regarded as a texton operator, resembling some more recent methods based on image patch exemplars.

The learning vector quantization based approach still has certain unfortunate properties that make its use difficult. First, the differences gp – gc are invariant to changes of the mean gray value of the image but not to other changes in gray levels. Second, in order to use it for texture classification the codebook must be trained similar to the other texton-based methods. In order to alleviate these challenges, only the signs of the differences are considered:

t (s(g0 – gc), s(g1 – gc), . . . , s(gP–1 – gc)),..(2.8)

Local binary patterns depend on the local region around each pixel. See the diagram below:



The reference pixel is in red, at the centre. A number of points are defined at a distance r from it. These are the green points. As you go from left to right, the number of green points increases.

The “pattern” in the name is the relationship of the value at the green points when compared to the central red point. We call it a binary pattern because all that is taken into account is whether the value at the green point is greater than the value at the red point. As you can see, the green points do not necessarily fall exactly on another pixel, so we need to use interpolation to find a value for the green points.

VI. SYSTEM TESTING:

Testing objectives:

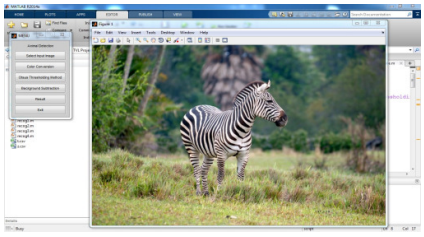
Testing is a set of activities that can be planned in advance and conducted systematically. For this reason a template for software testing, a set of steps into which we can place specific test case design techniques and testing methods should be defined for software process. Testing often accounts for more effort than any other software engineering activity. If it is conducted haphazardly, time is wasted, unnecessary effort is expanded, and even worse, errors sneak through undetected. It would therefore seem reasonable to establish a systematic strategy for testing software.

In this testing the SQA team follows these methods:

1. Peer review
2. Code walk and throw
3. Inspection
4. Document Verification

VII. MATLAB RESULTS:

i) input image



ii) RGB to GRAYSCALE image

iii) Otsu’s thresholding image

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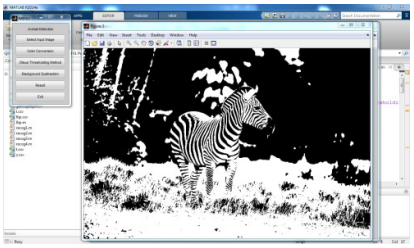
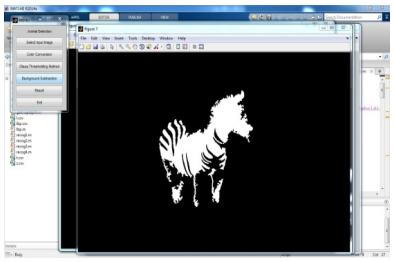
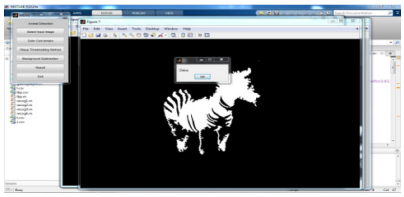


iv) Background subtraction image



v) Output image



VIII. CONCLUSION

The animals, several of which are already dying out or endangered, are often kill in revenge or to avoid future conflict. So this zone is to be monitor incessantly to put off way in of wild animals. With regard to this predicament, proposed system is developed which will monitor the field using camera and captured image of the intruder will be confidential using image processing so that suitable action can be taken.

Advantages:

- Fast incident detection
- Very convenient to detect object.
- Cover over all area rather than existing method.

Applications:

- It avoid the damage of plants in farming areas
- It also save the animals during farm protection process
- The animal detection systems is provide security from wild animals in agriculture

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