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Object Detection by Image Processing for Lossless Farming

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Abstract: ***Surveillance of farm from a remote location. The traditional farm surveillance requires manual detection of objects. In this paper we are going to see various techniques used for object detection. The actual shape of the object from a sequence of video frames determined. For identification of object we are going to use moving object detection, perform a series of morphological operations, feature extraction etc. Main goal of our system is to automatic object detection and notify the user so that necessary action can be done.***

Keywords: GMM, NCC, HARR, Famrming.

I. INTRODUCTION

Surveillance of a farm from a remote location and to give alerts if any suspicious activity occurs in the farm for damage free farming. The traditional methods used for farm security are not efficient enough to complete security. The traditional method used for farm security is by personally by farmer himself and by using scarecrow. By using image recognition software can produce efficient farm security tool. The techniques used for object detection are 1) Morphological Operations, 2) Feature Extraction 3) Template Matching [1]. Image morphology is the method of extracting useful information from an image using a step by step procedure. The steps involved are 1) acquire the captured input image. 2) Convert input image to different color spaces. 3) Remove unnecessary background image pixels from the image. 4) Add required rows and columns (set the of value 0 i.e. black pixels). 5) Read image one pixel by pixel and locate pixel that crosses threshold 1. 6) If pixel crosses threshold 1, define window and search for pixels that cross threshold 2 within the window. 7) Repeat all these steps until the last pixel in the input image is read. 8) Convert image into gray level. 9) Compare the size of threshold to delete the objects of smaller size. 10) Delete the previously added rows and cols. Add black pixels in place of previously removed rows of horizon pixels above the water surface. This helps in the accurate determination of the location of birds in the captured image. 11) Dilatation or filling holes of the objects. 12) Return the output image. Moving object detection is act of separating non-stationary object from consecutive video frames. The foreground moving target objects are discovered from a sequence of video frames. For the analysis of scenario it is divided into three parts: identification of target object, tracking the object from given series of frames, analyzing the behavior of the object. The successful implementation of the proposed system will lead to increase in the production without the loss of crop quality.

II. LITERATURE SURVEY

Moving object detection has become a hottest topic of discussion in field of computer science due to its wide range of applications like video surveillance, monitoring of security at airport, law enforcement, video compression, automatic target identification, marine surveillance and human activity recognition. Several techniques have been developed for object detection, out of which Background Subtraction, Frame differencing, Temporal Differencing and Optical Flow are widely used as traditional methods. Moving object

detection involves locating moving object in the frame of a video sequence. It has always been a tough job in field of image processing since results of moving object detection techniques are highly affected by variations in illumination and background changes.Also differences in shape, size motion and speed of moving target makes the task more complicated. Maximum amount of work is done to obtain accurate results considering the above mentioned challenges. This paper describes some of the recent research trends which have been developed for moving object detection to obtain higher performance with reduced errors.

III. EXISTING SYSTEM

Moving object detection is tedious task and involves a number of challenges like changes in intensity of light and illumination, variations in farming scenario; avoid detection of other non-stationary objects such as moving leaves, insects, rain, shadows etc. Moving object detection is tedious task and involves a number of challenges like changes in intensity of light and illumination, variations in farming scenario; avoid detection of other non-stationary objects such as moving leaves, insects, rain, shadows etc. We have developed a real time recognition system that could capture images from a camera, perform the moving object detection and send the image to the user when suspicious activity occurs. This results in less damage to the farm from the intruders. Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. A common technique is to perform background subtraction, which identifies moving objects from the sequence of video frame that varies significantly. For identifying object as a bird there is bunch of techniques for that like template matching, skeleton extraction, contour based technique, edge based technique, etc. Here after survey, best methods suitable for bird detection are selected and then efficiency of proposed scheme is measured. Image morphology is the step by step method of extracting useful information from the image. Some steps include removing the pixels above the ground and plants surface, thresholding based on the intensity, size. Finally, we divide the image into 3 vertical sections and use these sections to locate birds and telling the user by alerting. This method compares an input image with a standard set of images, known as templates. For bird identification templates are bird parts cut from various pictures. A threshold correlation value is determined and if the correlation between the template and the input image is above the threshold value then the input image is considered to have birds. Accurate recognition of birds requires the use of multiple template images since template matching is not invariant to rotation, size, etc.

III. PRAPOSED SYSTEM

Moving object detection is the act of segmenting target objects of interest as the foreground image with respect to background image. The main aim of moving object detection is to discover foreground moving target object in every video frame.Object Recognition Methods are used for the purpose of recognition of target image. Recognition is a process of segregating the objects of interest that is foreground image from the background image. Recognition becomes easier if the birds are distinct from the surroundings in terms of color, shadows etc. In the traditional techniques there were very few efforts have been made in the direction of recognizing birds in a given image. Several methods have been implemented in the past to recognize or discriminate objects such as weeds and plants in an image, which can be used for recognizing birds. Motion of other non-stationary objects is another challenge in object recognition.

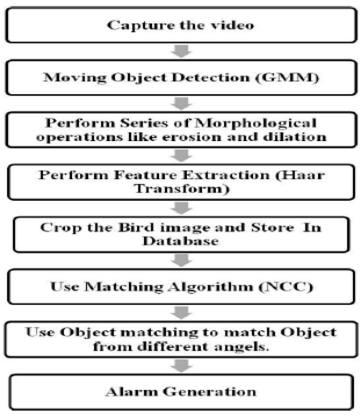

Fig.1: Steps of implementation

The steps used in our system are: 1) Capture video-To capture the real time video using any general purpose camera. 2) Moving object detection-Here for proposed system we have used Gaussian mixture method for background subtraction. By using background subtraction method, we divide the captured image into two parts that foreground image and back ground image. 3) Morphological operation-Morphological operations are used to study the actual shape of the object. It will separate the object more clearly and returns the coordinates of detected objects. 4) Feature Extraction-Here we have used the HAAR transform on the captured image. Necessary approximations, horizontal, vertical and diagonal values of the image are calculated. 5) Create the Database-To create the database, we have created two folders. One folder will contain the target images and one folder will contain the template images. The target images are extracted images from that video. 6) Template Matching-The captured target images are then compared to the template images which we have stored in the database. For this purpose we have used normalized cross-correlation.

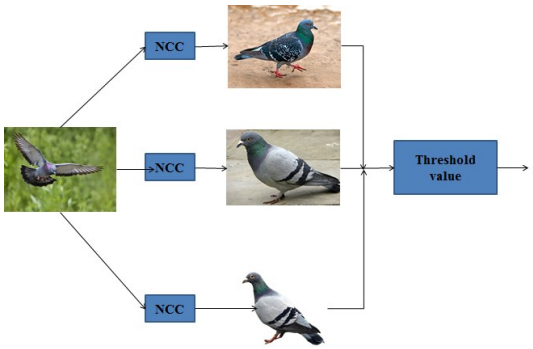

Fig2: Template matching using NCC

IV. ALGORITHM

A. Gaussian Mixture Model

Gaussian Mixture is the technique used for dividing the captured image into two parts that is foreground image and background image. The modeling is based on the calculating the probability of density of the color value for each pixel. It is considered that the color value of a given pixel is calculated for the surface of an object which is in the view of the concerned pixel. The probability of given pixel value is $p_t$at the instant of time t is given by

$$P(pt) = \sum_{i=1}^{k} \omega i, t\eta\,(pt, \mu, \sum i, t)$$

Where k denotes number of Gaussian mixture.The normalized Gaussian η is a function of$\omega_{i,t}$, $\mu_{i,t}$, $\Sigma_{i,t}$ which represent the weight, mean, and the covariance matrix of the i^{th}Gaussian mixture at time *t* respectively. The weight indicates the influence of the i^{th}Gaussian at time *t*.

B. Haar Transform

HAAR Transform is one of the most basic and simplest method used for Feature Extraction. It is also called HAAR wavelets transform. It involves only addition and subtraction due to its orthogonal nature. Hence, it can easily be implemented on Computer application. It consists of filter bank which is combination of low pass filter and high filter. The low pass filter is used for averaging operation [2].

$$H = 1/\sqrt{2}(1,1)$$

The high pass filter is used for differencing purpose.

$$G = 1/\sqrt{2}(1,-1)$$

The steps for calculating the HAAR transform are as follows:

1. Calculate the average of each pair of samples.(n/2 averages)
2. Calculate the in between the each average and the samples.(n/2 differences)
3. Write the second half of the array with differences.
4. Repeat all the on the first half of array.

Normalized cross-correlation is the advanced version of the traditional method of cross-correlation that consists of improvements over the traditional cross-correlation.

The results are constant to the global brightness changes having constant brightness or darkness of the image without affecting the expected result. The final resultant value is scaled to [1,-1] range, so that Normalized cross-correlation of two images being compared is 1 and its negation is -1[3].

CONCLUSION

Moving Object Detection is a significant and efficient research area that is efficiently implemented by number of applications. Our aim is to present the established tactics for moving object detection and study its recent developments and portray the shortcomings of traditional method. Intelligent farm surveillance system refers to the image processing techniques for identification of intruders in the farm. Different image processing techniques have been surveyed and implemented to recognize birds in video more efficiently. Background sub-traction methods such as mixture of Gaussian and sum of absolute differences are implemented on the video [4]. We have found that of all the techniques Gaussian mixture model was comparatively more efficient. For feature extraction, HAAR transform was implemented. Lastly template matching mechanism is used for detecting bird from the video. Normalized cross correlation technique is used.On detection of the bird an alarm is generated as a feedback. We have observed that the above methods work well for bird detection [5].

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