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A Survey on Different Technique for Real Time Moving Object Detection

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***Abstract*— Real time moving object detection is more important role in video surveillance system. It is important to increase the efficiency to detect moving object and also reduce the false detection like moving of tree through waves or also environment effects. This Paper deals with survey and comparison of different method for real time moving object detection.**

Keywords—Object Detection,Background Subtraction, Gaussion Mixture Model, Temporal Differencing, Eigen Background, Nonparametric Kernel Density Estimation

I. INTRODUCTION

Real time moving object detection is nothing but sensing the physical movement in particular area. In now a day for security concern in various different areas like bank, shopping mall, shop, college are require video surveillance system to detect unusual activity.

The task of reliably detecting and tracking moving objects in surveillance video, which forms basis for higher level intelligence applications, has not fully solved and has many open questions [1]. The principle sources of difficulties in the task of moving object detection are: 1) changes in appearance of the objects with viewpoint, illumination and articulation 2) partial occlusions of the target objects by other objects 3) Complexity of the background that is presence of waving tree leaves, waving of river water etc (4) environment changes [1].

This paper is organized as follow. In section II, we describe different object detection technique. In section III, we describe comparative analysis of different methods. In section IV, Steps for moving object detection Section V represents conclusion and future work.

II. VARIOUS MOVING OBJECT DETECTION TECHNIQUE

A. Background Subtraction [6]

Background subtraction method is easily applies for the static background. Static background means the camera position is fixed. In that the background image take as reference image and than current frame is subtract from the reference image to differentiate foreground and background. Background subtraction is not directly applied for the outdoor because of different environment infuses.

In work of Heikkila and Silven a pixel at location (x, y) in the current image is marked as foreground if [1]

$$|I_t(x,y)-B_t(x,y)|>\tau \quad (1)$$

Condition is satisfied for predefine threshold. When the background image or reference is changed than it is modified with following equation

$$B_{t+1}=\alpha I_t + (1-\alpha) B_t \quad (2)$$

To improve quality of detected foreground regions (to remove noise), some post processing operation such as morphological erosion and dilation can be used [1]. Background subtraction technique takes long time for detecting moving object [2].

B. Gaussion Mixture Model [1][7]

Simple background subtraction model is robust for only indoor environment. In 1998, Stauffer and Grimson developed a technique which represents each pixel by a mixture of Gaussians (MoG) and updates each pixel with new Gaussians during run-time [1]. This background subtraction technique has become robust again for the indoor and outdoor environment.

In this technique each pixel is calculated as the Gaussian. Usually it used three to five Gaussian for the differentiate foreground and background pixels. This technique is robust again different environment influences like light illumination, leaves moving through waves. So, that this algorithm is applied for many computer vision work.

Gaussian Mixture Model (GMM) cannot make a well-suited background model and cannot detect foreground

objects accurately when the intensity of the background changes frequently [4].

C. Eigen Background [1]

N. Oliver et al. proposed an Eigen space model for moving object detection. In this method, dimensionality of the space constructed from sample images is reduced by using Principal Component Analysis (PCA) [1].

In this technique to reduce space part is given a static part of the background. So, that when image is projected on this space is given the moving object.

This technique cannot be applied for the outdoor system because it cannot detect environment effect and dynamic model.

D. Temporal Differencing [3]

Temporal differencing makes use of pixel-by-pixel difference between two or three consecutive frames in an image sequence to extract moving regions [1].

In this technique it compares the three consecutive frames and extracts the foreground object from the frame so it is better to apply the dynamic environment. The basic flow of object detection using temporal differencing is shown in fig.1

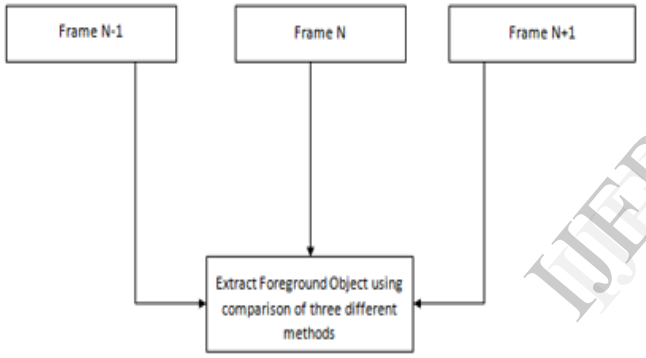


Fig. 1. Basic Working of Temporal Differencing Technique

Temporal differencing technique is not suitable for homogeneous color region. If the object color and background color is same than it is not accurately detect moving object.

E. Non Parametric Model [5]

Kernel density estimation is a nonparametric technique for density estimation in which a known density function (the kernel) is averaged across the observed data points (pixels) to create an approximation to density [1].

Kernel Density model is better for that where the background is not completely static means leaves moving through the waves, light illumination changes.

Kernel density model is not accurate when the camera position is little bit change it give false detection. This technique requires high cost for implementation and it is not easy to apply it to real-time processing [4].

III. COMPARATIVE ANALYSIS OF DIFFERENT METHOD

In this Section we describe comparison of different method which we discuss in section II.

TABLE I. COMPARISION OF DIFFERENT TECHNIQUE

Methods	Advantage	Limitation
Background Subtraction [6]	Used background as reference image so it can easily subtract background from captured frame	noise removing some pre-processing are required. Apply only for indoor system
Mixture of Gaussian [1][7]	Used Gaussian value for each pixel so it can easily classify background and foreground	Not apply when intensity of background change frequently
Eigen Background[1]	Static part is reduced using PCA so that frame is projection of that static part it extract the foreground object	It is not preferred for dynamic scene analysis
Nonparametric Model [5]	It remove false background detection like moving tree braches.	Cost is quite high.and not directly apply for real time.
Temporal Differencing[3]	Detect differencing in two or three consecutive frames for that it is used for real time detection	Cannot extract all pixel of homogeneous colour region

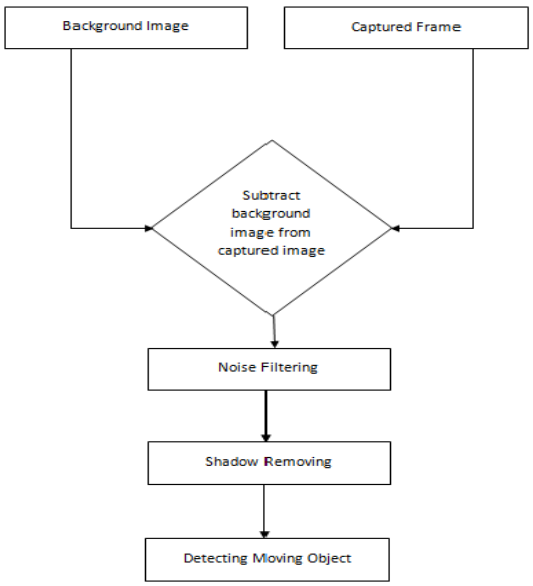
IV. STEPS FOR MOVING OBJECT DETECTION

For detection of moving object the concept of image segmentation, image filtering, image enhancement, color image processing, image classification are required. Here we describe the sample flowchart of object detection in different video surveillance system.

A. Fix Camera

In this type of camera, when the camera is paced any location this particular area is fixed which is captured by the camera. In this type of camera the motion detection is very easy because of the foreground object can be easily classified through referenced background image.

The flow of moving object detection is shown into the Fig 2. In that the first part is store the background as referenced image and after that capture one by one frame. In third steps subtract the background part from the captured frame it means perform segmentation on the captured frame to extract the foreground object. In fourth steps the image filtration is done for the removing noise and shadow removing from the foreground image. Some classification technique is perform when classify different class of object.



a.

Fig. 2. Flow of moving object deteion in fixed camera.

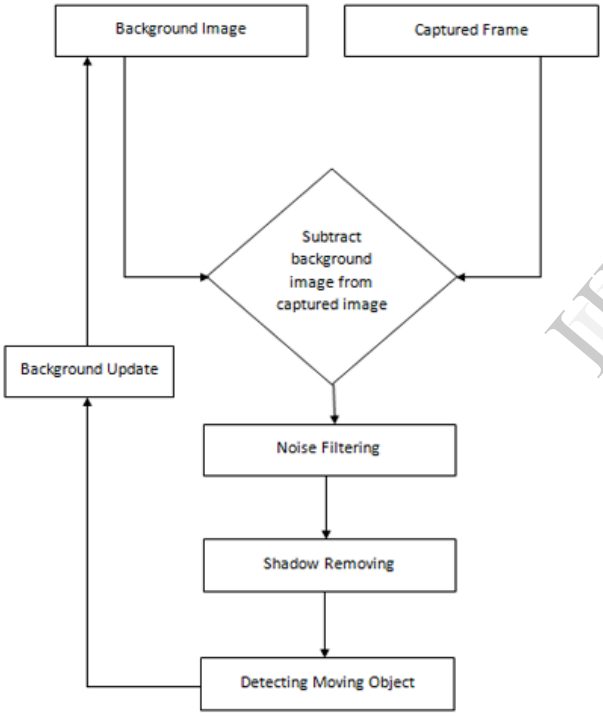


Fig. 3. Flow of moving object detection in pan-tilt-zoom camera

B. Pan-Tilt-Zoom Camera

In this type of camera, when camera is placed any location the neighbor area of that camera is also capture. So, that wide area is covered.

The flow of moving object detection is shown in to the fig 3. In that the four steps is same as fixed camera. In the fifth step background is update so that when the background is changed the flow o execution is not break down.

Background update technique is not proper technique for this type of camera because of that the every time to update background is require more memory and it time consuming. So it is not apply for real time system.

V. CONCLUSION AND FUTURE WORK

In this paper, we have carried out different method for moving object detection with their advantage and limitation. We have also discussed the flow of execution in different type of camera. While all of these methods our goal is to detect moving object accurately in indoor and outdoor and also its fast, robust and require less space. In future we are try to develop more accurate technique for moving object detection.

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