Evaluation of Moving Object Classification Using Static Appearance Features

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Abstract: *This paper present a evaluation of different technique related to surveillance system improving the security. The objective of this paper is to examine various moving object detection (MOD) and tracking method. This paper focuses on detecting a moving object in visual surveillance system then tracking the detected object in the scene. Detecting a moving object is initial low level main task in any visual surveillance application. Tracking is necessary in high level application that needs the location and shape of an object in all frames. In this study, I illustrate Background subtraction with alpha, Eigen background Subtraction, statistical method, and Temporal frame differencing to detect moving object. I also explain tracking process based on kernel tracking, point tracking and silhouette tracking.*

Key Words: *Input video, Optical flow, Frame separation, Frame difference, Background subtraction and Temporal frame differencing, Morphological Filtering, Motion detection.*

1. INTRODUCTION:

Video surveillance is a method of examine video series It is an active area in computer vision and gives vast amount of data storage space and display. Three types of Visual surveillance actions are there. Video surveillance actions can be physical (manual), semi-autonomous or fully-autonomous [10]. Manual surveillance involves study of the visual content by a human and these are generally used. Semi-autonomous surveillance involves various forms of visual processing with important human interference. Typical cases are systems to do simple motion detection [5]. Only in the existence of major motion the video is recorded and feed for examination by a human professional. By a fully-autonomous system [10], merely input is the video series in use at the site where inspection is performed. In such a system where there is no person interference and the system perform both the low-level jobs and also high-level decision, like motion detection, tracking, and creating task like irregular event recognition and gesture recognition respectively. Video surveillance method support automated object classification and tracking. Monitoring of video for long period by human operative is not sensible and infeasible. Automatic motion detection which provides batter human interest [9]. There is variety of application in video surveillance like person identification, access Control, and anomaly recognition. Intelligent visual surveillance (IVS) refers to an automatic visual examine method that involves examine and analysis of object behaviors, as well as detecting an object and its tracking, to recognize the visual actions of the scene [11]. Main responsibility includes scene interpretation and broad area surveillance control. Scene analysis identifies and track moving object in an image series. It is employ to recognize their behaviors.

2. MOVING OBJECT DETECTION:

MOD is the basic step for more analysis of video. Each tracking system need mechanism of detecting an object either each frame or when the object first appear in the video. It handles segmentation of moving object from an unmoving background object [3], even decrease computation time. Object segmentation is difficult due to environmental conditions like shadow object segmentation, illumination changes becomes difficult. A common method for detecting an object is to use information in a distinct frame. However, several object detection systems make use of the temporal information figured from a chain of frames to decrease the number of fake detections [16]. This secular information is typically in the figure of frame differencing, which attracts regions that modifies dynamically in successive frames. Known the object region in the image, it is next the tracker's job to carry out object correspondence from one frame to another to generate the track. These section analysis three MOD methods are background subtraction with temporal difference, alpha parameter, and statistical methods, Eigen Background Subtraction.

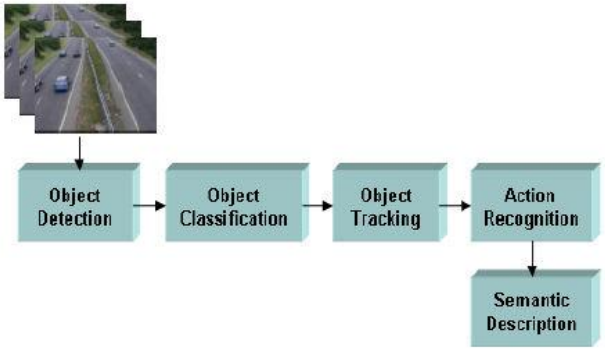


Figure 1: Framework of Video Surveillance System

3. METHODOLOGY:

Detecting an object is the method for identifying the non stationary or moving object in a video series. This is the key and main step in the direction of moving object tracking.

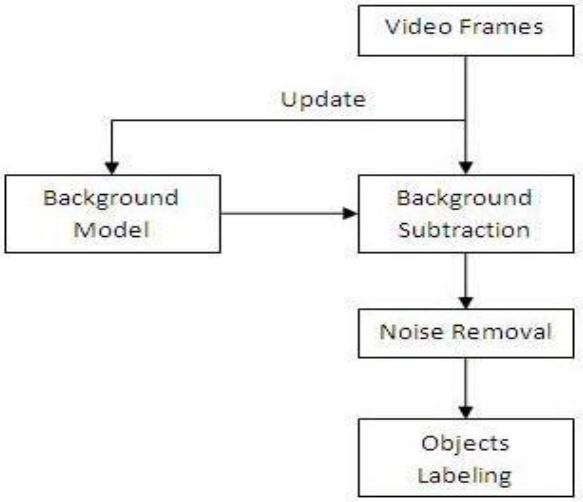


Figure1: Moving object detection block diagram

A. Optic Flow

Optical flow is alternative standard form of object detection in which the optical flow. It is pattern of evident motion of object in a visual surveillance. The motion between dual video frames occupied at period *t* and *t+ δt* at each single location is approximated in optic flow process. This method provides the major information about the movement of the object. It also notice the object exactly compared to that of background method. This technique is not broadly uses due to its huge computation and it is very receptive to noise. It is not good for real-time occlusion condition.

B. Background subtraction Technique

It is the most frequently used method for MOD. It can be of two types: 1) By considering first frame as the reference frame or background image. 2) By considering average of „n" frames as the background image. In this background subtraction process each pixel of progress frame is subtracted with the pixel of the background image. The equation (1) and (2) shows the background subtraction method for first frame as the background image.

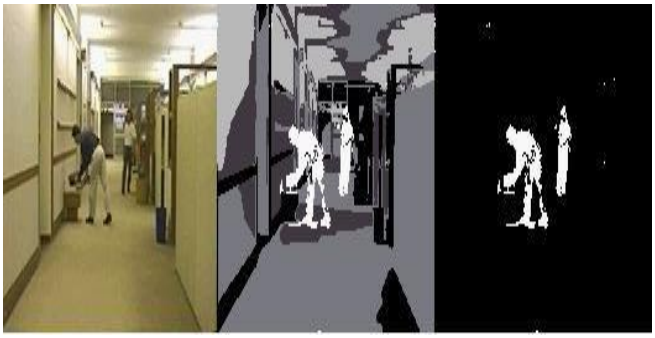
$$B(a, b) = A(a, b) \quad (1)$$

where *B(a, b)* represents background image pixel by pixel. The background subtraction technique divides the video frame into forefront and background object, where the forefront object is determined by matching the present frames *A(a, b)* through the reference image *B(a, b)*. The equation used is

$$C(a,b) = \begin{cases} 1 & if\ B(a,b) - A(a,b) > threshold \\ 0 & otherwise \end{cases} \quad (2)$$

where *C(a, b)* is the foreground pixel, threshold value can be set manually or can selected automatically as per video input.

This process consumes a lesser amount of memory. Accuracy of detection is moderate. But it will never suit for multimodal backgrounds. Outcome of the background subtraction methods are as showed in figure 3.



(a) (b) (c)

Figure 3: Background subtraction result for monitoring video (a) Original Video Frame (b) Background Subtraction (c) Resulting frame.

C. Frame difference

The frame difference is the one in which every current frame pixel is subtracted with its previous frame pixel. If the change is better to the manually set threshold value than that pixel is reflected as the foreground pixel or else the pixel is reflected as the background pixel. Equation (3) gives the means for frame difference

$$F(a,b) = \begin{cases} 1 & if\ I_n(a,b) - I_{n+1}(a,b) > T \\ 0 & otherwise \end{cases} \quad (3)$$

Where *In* is the prior frame pixel and *In+1* is the pixel

value of the current frame. T will be the threshold value which is manually defined by the user. Estimation of this process is modest and easy. For dynamic environments, it is very difficult to achieve complete outline of the moving body. So it is very unwieldy to get accuracy. Results of the frame difference methods are as shows in figure 4.

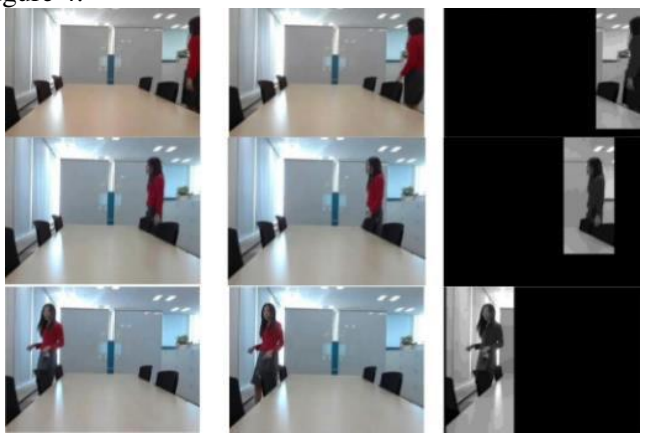


Figure 4: Frame difference result of monitoring video.

D. Temporal Differencing

This method makes use of the pixel-wise difference between two or three successive frames in video images

to extract moving regions. It is an extremely adaptive approach to dynamic scene changes however, it fail to take out all relevant pixels of a foreground object particularly when the object has regular texture or goes gradually [3]. When a foreground object discontinues moving, temporal differencing system is unsuccessful in identify a change between consecutive frames and loses the object. Let In(x) stand for the gray-level intensity value at pixel point x and at same instance n of video image series I, which is in the range [0, 255]. T is the threshold firstly put to a preset value. Lipton et al.[4] developed two-frame temporal differencing system suggests that a pixel is moving if it satisfies the following [4]:

$$| I_n(x) - I_{n-1}(x) | > T \qquad (4)$$

This method is computationally less complex and adaptive to dynamic changes in the video frames. In temporal difference technique, extraction of moving pixel is simple and fast. Temporal difference might left hole in foreground object, and is more receptive to the threshold value when concluding the changes within difference of consecutive video frames.

4. COMPARITION OF METHODS:

Moving object detection and tracking turn out to be attractive and vital research subject for researchers. There are many techniques for the object detection and tracking. All the methods have their own advantages and disadvantages. A comparison is made between various methods their advantages and disadvantages:

Method	Advantages	Disadvantages
Centroid matching, HSV color matching	This algorithm has better results when we use it in detecting and tracking targets This algorithm is suitable for the real-time target tracking.	It cannot track the targets well when the number of the targets is large. For real time implementation. It requires some modification for real-time.
Gaussian mixture model, morphological operation	It is a recursive algorithm that estimates parameters of the mixture and simultaneously selects the number of components for each pixel	There are some changes requires for better output in real time video especially in traffic video surveillance system.(like cloudy, sunshine, night, windy)
Optical Flow, Otsu method, Horn and Schunck	Algorithm is applied in different image sequences and it gives better efficiency	Algorithm the main condition is that the camera must be stationary. If the came ra is moved by any areas on the result is not accurate.
Temporal, spatial saliency, Pixel Saliency and Region Saliency	By fusing both pixel saliency and region saliency, the moving object can be detected from the aerial video. The accuracy and efficiency of proposed algorithm is high.	The detected object may be larger than its real size.There may be holes in detection results When an object is moving s lowly, its motion is unreliable

5. CONCLUSION:

To analyze images and extract high level information, image enhancement, motion detection, object tracking and behavior understanding researches have been studied. In this paper, we studied and presented different methods of MOD, used in video surveillance. We have described background subtraction with alpha, temporal differencing, statistical methods. Detection techniques into various categories, here, we also talk about the related issues, to the MOD technique. The drawback of temporal differencing is that it unsuccessful to determine all related pixels of a foreground objects particularly when an object has consistent texture or moves gradually. When a foreground object stops moving, temporal differencing method fails in detecting a change between successive frames and loses the track of the object. We presented detail of background subtraction method in deep because of its computational effectiveness and accuracy. This article gives valuable insight into this important research topic and encourages the new research in the area of moving object detection as well as in the field of computer vision. Here research on object tracking can be classified as point tracking, kernel tracking and contour tracking according to the representation method of a target object. In point tracking approach, statistical filtering method has been used to estimating the state of target object. Kalman filter and particle filter are the most popular filtering method. In kernel tracking approach, various estimating methods are used to find corresponding region to target object. Now a day, the most preferred and popular kernel tracking techniques are based on Mean-shift tracking and particle filter. Contour tracking can be divided into state space method and energy function minimization method according to the way of evolving of contours.

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