Moving Object Detection for Video Surveillance System

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ABSTRACT
Moving object detection has been widely used in diverse discipline such as intelligent transportation system, airport security system, video surveillance applications, and so on. This paper presents two different methods for moving object detection, Simple Background subtraction method and Temporal Difference method. In both methods, we used Static camera for video capturing purpose. First of all, we obtain Difference image using Simple Background subtraction method and Temporal Difference method and then use fixed threshold method to obtain a more complete Moving Object. In this paper a Performance comparison of Simple Background Subtraction Method and Temporal Difference Method is carried out from literature as well as through implementation.

Keywords
Moving object Detection, Static camera, Fixed Threshold, video surveillance applications

1. INTRODUCTION
Automatic visual detection of object is crucial task for a large range of home, business, and industrial applications. Video cameras are among the most commonly used sensors in a large number of applications which ranging from surveillance to smart rooms for video conferencing. Moving target detection means to detect moving objects from the background image to the continuous video image. There is a need to develop algorithm for task such as moving object detection. Currently used methods in moving object detection are mainly the frame subtraction method, the background subtraction method and the optical flow method [1, 2]. Frame subtraction method [1] is through the difference between two consecutive frames to determine the presence of moving objects. Its calculation is simple and easy to Develop. For a variety of dynamic environments, it has strong adaptability, but it is mostly difficult to obtain a complete outline of moving object, and so that the detection of moving object is not accurate.

Optical flow method [4] is to calculate the image optical flow field, and do clustering processing according to the optical flow distribution features of image. This method gives the complete movement information and detects the moving object from the background better, due to a large quantity of calculation, sensitivity to noise and poor anti-noise performance; make this method not suitable for real-time demanding occasions.

The Background subtraction method [7] is use difference between the current image and background image to detect moving objects, with simple algorithm. And it can provide the most complete information about object in the case of the background is already known [8]. This method is effective to enhance the effect of moving object detection. In this paper, we used background subtraction method for moving object detection. In this basically we used a single static camera for detection. For moving object detection basically needed camera and typical setup is given as below.

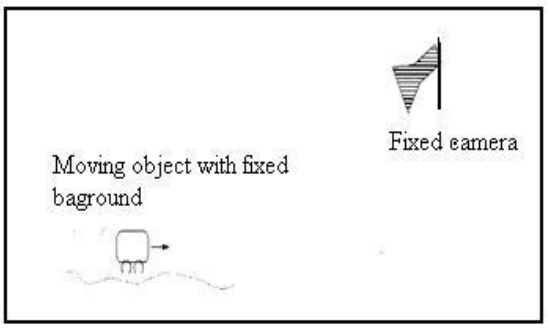

Figure 1: Typical setup for moving object detection in video

2. BACKGROUND SUBTRACTION METHOD
The background subtraction method is the common method of motion detection. It is a technology that uses the difference of the current image and the background image to detect the motion region [6], and it is generally able to provide data included object information. The background image is subtracted from the current frame. If the pixel difference is greater than the set threshold value T, then it determines that the pixels from the moving object, otherwise, as the background pixels. By using dynamic threshold method we can dynamically change the threshold value according to the lighting changes of the two images obtained. This method can effectively suppress the impact of light changes. Here we consider first frame as the background frame directly and then that frame is subtracted from current frame to detect moving object.

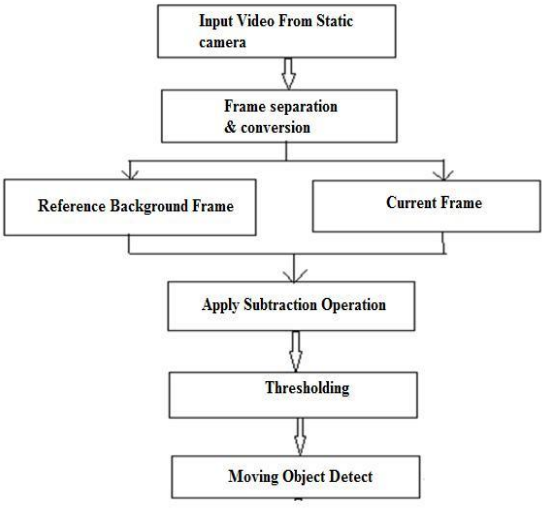

Figure 2: The flow chart of moving object Detection using simple background subtraction

Figure no.2 shows flow chart for moving object detection using reference Background. Reference Background means Background is fixed.

2.1 Moving Object Extraction

After the background image B(x, y) is obtained, subtract the background image B(x, y) from the current frame Fk (x, y). If the pixel difference is greater than the set threshold value T, then determines that the pixels occur in the moving object, otherwise, as the background pixels [1]. The moving object can be detected after applying threshold operation [2]. Its expression is given below:

$$D_k(x,y)=\begin{cases}1 & |F_k(x,y)-B(x,y)|>T \\ 0 & others\end{cases} \quad (1)$$

Where D_k (x, y) is the binary image of differential results, T is gray-scale threshold, dynamic, which will be selected according to the environmental conditions; its size determines the accuracy of object identification.

3. TEMPORAL DIFFERENCE METHOD

Temporal difference method computes the difference image between two consecutive frames[7],then, after thresholding the difference image, we can get moving object.

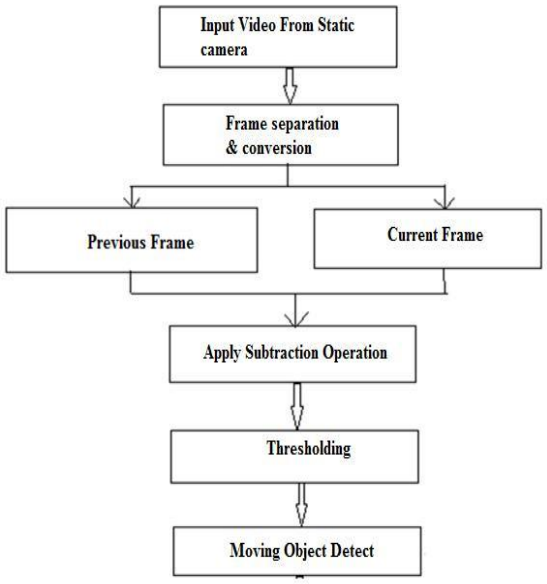

Figure 3: The flow chart of moving object Detection using temporal difference method

In this method subtract the previous image F_{k-1} (x, y) from the current frame F_k (x, y). If the pixel difference is greater than the set threshold value T, then determines that the pixels occur in the moving object, otherwise, as the background pixels [1]. The moving object can be detected after applying threshold operation [2]. Its expression is given below:

$$D_k(x,y)=\begin{cases}1 & |F_k(x,y)-F_{k-1}(x,y)|>T \\ 0 & others\end{cases}$$

Where,Fk is current frame at time t and Fk-1 is Previous frame at time t.

Simple background subtraction method can detect the moving object from the background better but it also detect stationary objects which become suddenly stop for long time.Temporal difference method not detect stationary object but very sensitive to Threshold.

4. EXPERIMENTAL RESULTS

Following figures shows results for moving object detection. Here we used static camera to capture video images Fig. no.1 shows Reference Background frame. For object detection we subtract reference background frame from current frame with some object so we get subtracted frame means difference between original image and current image.

Moving Object detection result using simple background subtraction method.

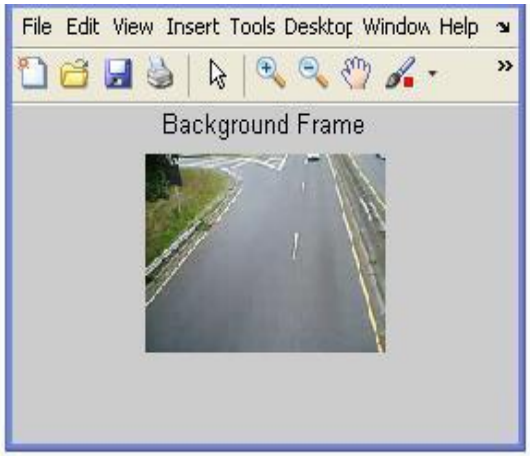

Fig4.Reference Background Frame

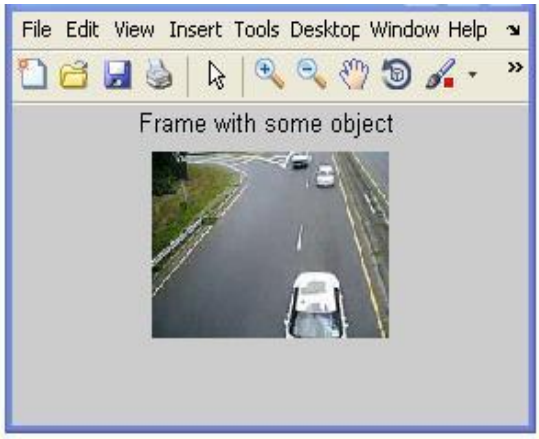

Fig5.current frame with some object

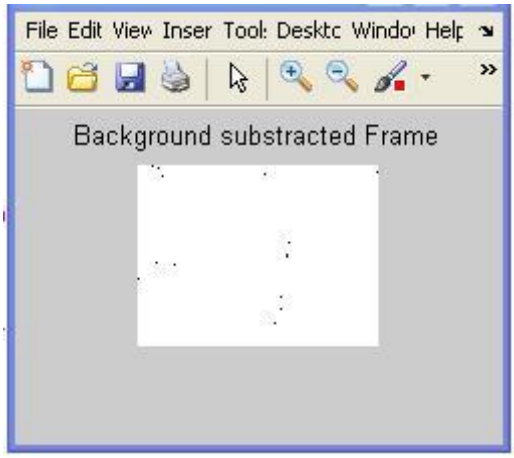

Fig 6.Reference Background subtracted Frame

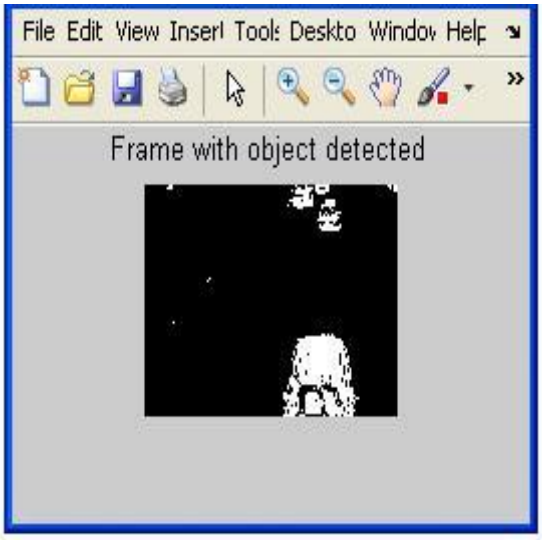

Fig7. Frame with object Detected

Moving Object detection result using Temporal difference method.

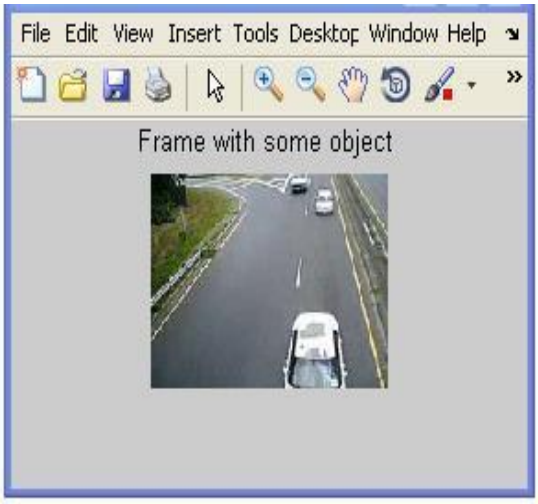

Fig8.current frame with some object

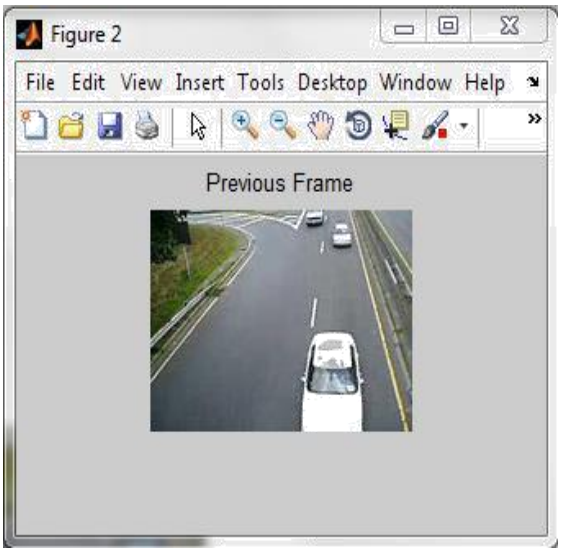

Fig9. Color frame with object detected

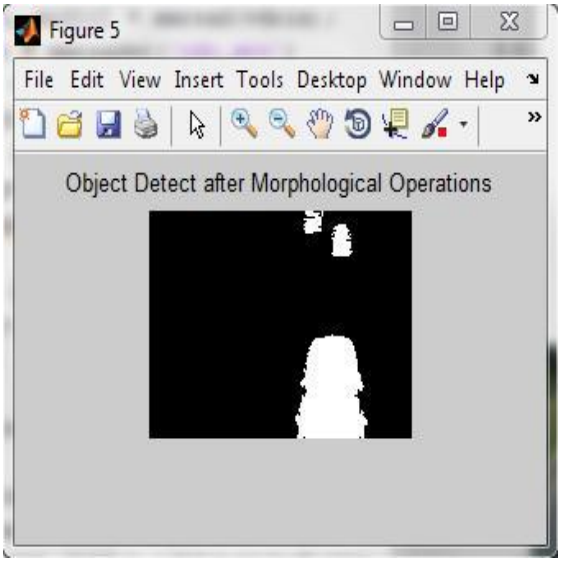

Fig10. Color frame with object detected 5

5. CONCLUSION

This Paper Presents Comparison of Two different algorithms for Moving object detection which are simple background subtraction and temporal deference and use dynamic threshold method to obtain a more complete moving object. Simple background subtraction method can detect the moving object from the background better but it also detect stationary objects which become suddenly stop for long time and Temporal difference method not detect stationary object but very sensitive to Threshold. This both methods are very reliable and mostly used in video surveillance applications.

6. ACKNOWLEDGMENTS

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