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Moving Object Detection and Tracking for Video Survelliance

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Abstract—Moving object detection and Tracking has been widely used in diverse discipline such as intelligent transportation system, airport security system, video surveillance applications, and so on. This paper presents the moving object detection and tracking using reference Background Subtraction. In this method, we used Static camera for video and first frame of video is directly consider as Reference Background Frame and this frame is subtract from current frame to detect moving object and then set threshold T value. If the pixel difference is greater than the set threshold T, then it determines that the pixels from moving object, otherwise, as the background pixels. But this fixed threshold suitable only for an ideal condition is not suitable for complex environment with lighting changes. So that in this paper we used dynamic optimization threshold method to obtain a more complete moving objects. This method can effectively eliminate the impact of light changes.

Keywords: Moving object Detection, Static camera, Moving Object Tracking, Reference Background, video surveillance.

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. Moving target tracking means to find various locations of the moving object in the video. 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.

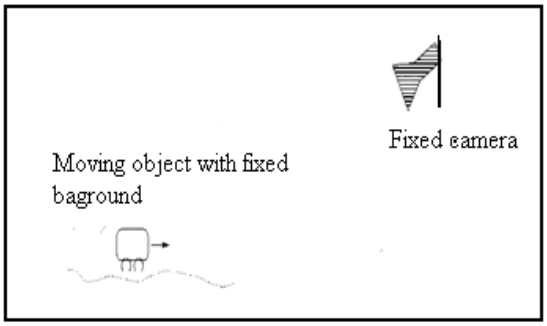

Fig.1 Typical setup for moving object detection in video

2. OVERVIEW OF THE SYSTEM

In proposed system the main aim is to build robust moving object detection algorithm that can detect and Track object in video.

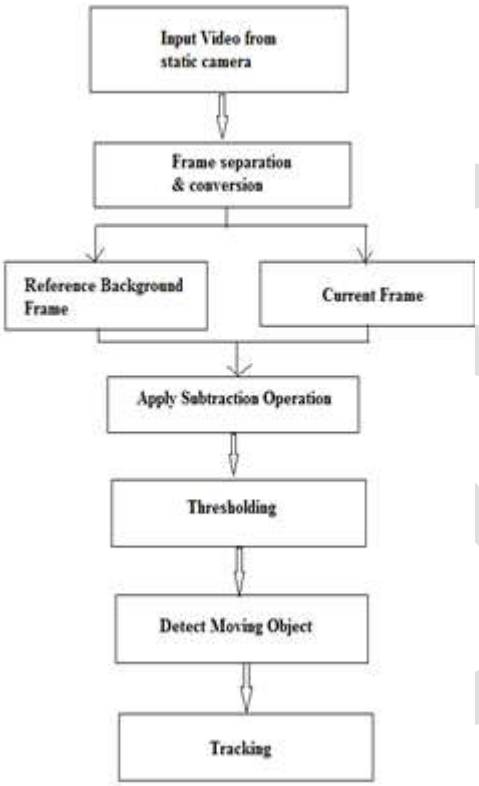

Fig.2 Overview of the system

1. The first step is to take input video from static cameras. For processing the video files, convert video into frames and from frames to images.
2. Next step is take first frame as a Background frame and next is current frame and then apply subtraction operation. Background frame is subtracted from current frame.
3. Then Threshold operation is performed and foreground object is detected.
4. After object detected last step is track object in video.

3. 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.

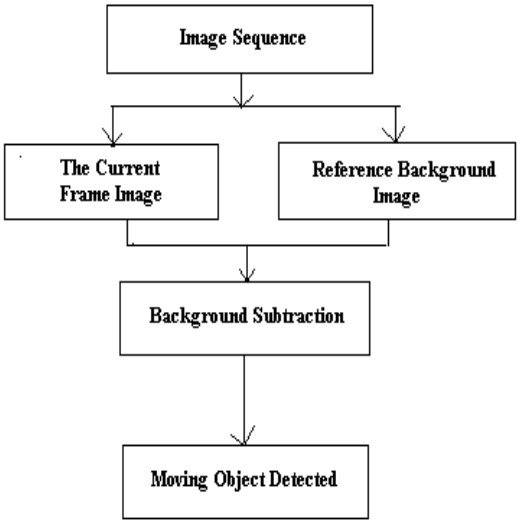

Fig.3 The flow chart of moving object Detection

Figure no.3 shows flow chart for moving object detection using reference Background. Reference Background means Background is fixed.

4. MOVING OBJECT DETECTION

4.1 Moving Object Extraction

After the background image *B(x, y)* is obtained, subtract the background image *B(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:

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

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.

As in the algorithm *T* is a fixed value, only for an ideal condition, is not suitable for complex environment with lighting changes. Therefore, we refer the dynamic threshold method, using this method we dynamically changes the threshold value according to the lighting changes of the two images obtained. On this basis, add a dynamic threshold ΔT to the object detection algorithm. Its mathematical expression is given below:

$$\Delta T=\lambda\bullet\frac{1}{M\times N}\sum_{i=0}^{N-1}\sum_{j=0}^{M-1}|F(i,j)-B(i,j)| \qquad (2)$$

Then,

$$D_k(x,y)=\begin{cases}1 & |F_k(x,y)-B_k(x,y)|>T+\Delta T \\ 0 & others\end{cases} \qquad (3)$$

Where A is the inhibitory coefficient and it set according to the requirements of practical applications and its reference value is 2,[1]. M x N is the size of each image to deal with [2]. *M* x *N* numerical results indicate the number of pixels in detection region. ΔT reflects the overall changes in the environment. If small changes in image illumination, dynamic threshold ΔT takes a very small value. Under the premise of enough pixels in the detection region, ΔT will tend to O. If the image illumination changes significantly, then the dynamic threshold ΔT will increase significantly. This method can effectively eliminate the impact of light changes.

5. OBJECT TRACKING METHOD

Moving target tracking means to find various locations of the moving object in the video sequences.

Tracking information about the moving objects is represented using a vector state notation by
$X_t = [X_{t,n} | n=1,\ldots\ldots,N_0]$ (4)

Where *No* is the number of moving objects at time step *t* .

$X_{t,n} = [r,R]_{t,n}$ (5)

The *nth* component contains the (r) object centroid and the (R) Square bounding of an object, respectively.

6. EXPERIMENTAL RESULTS

Following figures shows results for moving object detection using Reference Background subtraction. 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

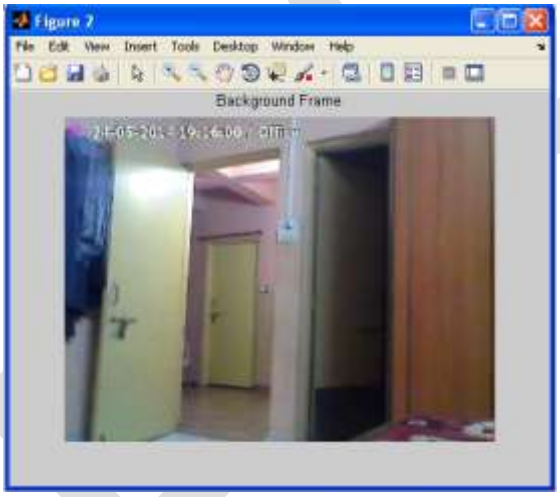

Fig4.Reference Background Frame

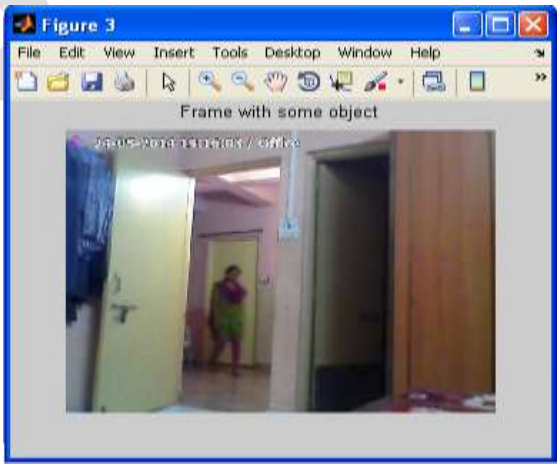

Fig5.current frame with some object

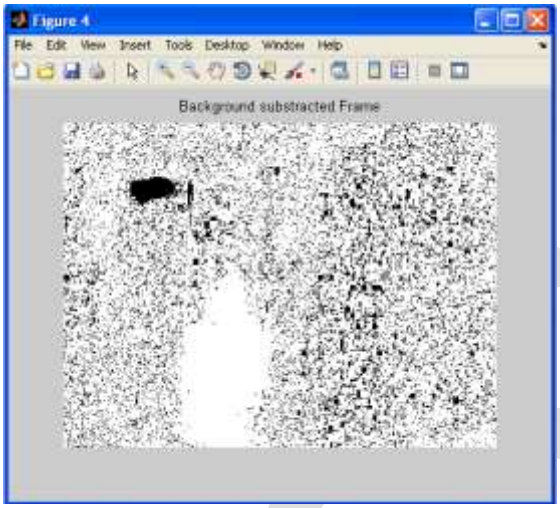

Fig 6.Reference Background subtracted Frame

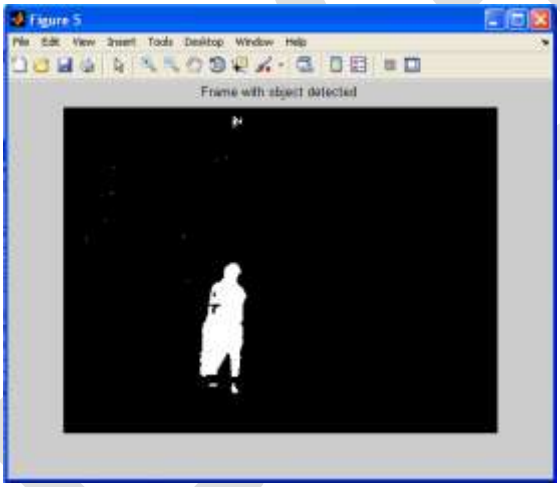

Fig7. Frame with object Detected

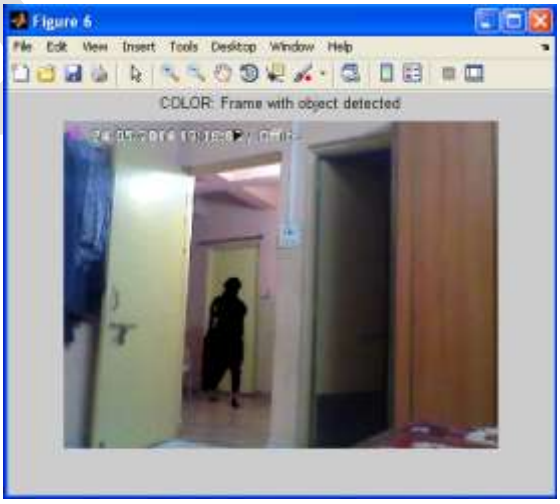

Fig8. Color frame with object detected

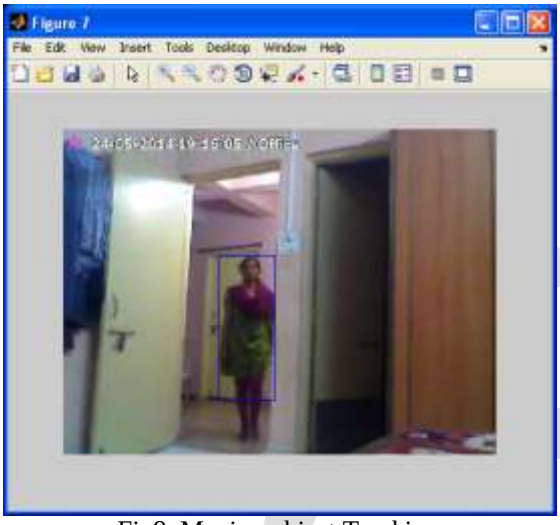

Fig9. Moving object Tracking

7. CONCLUSION

In this paper, a real-time and accurate method for moving object detection and Tracking proposed based on reference background subtraction and use dynamic threshold method to obtain a more complete moving object. This method can effectively eliminate the impact of light changes. This algorithm is very fast and uncomplicated, able to detect moving object better and it has a broad applicability. This method is very reliable and mostly used in video surveillance applications.

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