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REVIEW ARTICLE

Review: Moving Object Detection Techniques

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Abstract— Now a day, Moving Object detection is becoming very popular, yet challenging vision task. It is a critical part in many applications such as image search, image auto-annotation and scene understanding. . The vision systems that include image processing methods are widely implemented in many areas as traffic control, video surveillance of unattended outdoor environments, video surveillance of objects, etc. Background subtraction techniques are very useful, simple and efficient techniques. This paper includes the various techniques existing for Moving Object detection and their comparison.

Keywords - Background subtraction, Frame differencing, Mixture of Gaussian, Moving object detection.

I. INTRODUCTION

The detection of an object in a video camera scene is a relatively new research area in computer science and, because of its broad applicability in real life this has been growing more and more. The CCTV is one of the main reasons for the growing interest and use of video in security systems. Moving object detection in a video stream is an essential step in video surveillance applications. In some algorithms, the moving objects may become part of the scene when they come to a stop. Also the scene maybe affected by changes in the light, leaves swaying, cameras shaking, etc. Many algorithms for moving object detection have been proposed in recent years. These involve background subtraction, optical flow, temporal difference and many other algorithms for detecting moving objects. From these, the most widely used algorithm is background subtraction which has many algorithms such as frame difference, approximate median, Gaussian mixture.

II. MOVING OBJECT DETECTION TECHNIQUE

The video surveillance has long been in the use for monitoring security sensitive areas for example banks, departmental stores, traffic monitoring on highway, public places which are crowded. Moving object detection methods are used to detect a moving object like human, vehicles etc. There are various methods that are used to detect the moving object.

Different Moving object detection methods are described as follows:

A. **Temporal Differencing**

This method uses the two adjacent frames based on time series image to subtract and gets difference images, its working is very similar to background subtraction method [6]. After the subtraction of image it gives moving target information through the threshold value. This method is simple and easy to implement. This is very adaptive to dynamic scene changes, however, it generally fails in detecting whole relevant pixels of some types of moving objects. Additional methods need to be adopted in order to detect stopped objects for success of higher levels are computationally complex and cannot be used real-time without specialized hardware.

B. **Background subtraction method**

It is particularly a commonly used technique for object detection in static images [6][7][8]. It will detect moving regions by subtracting the current image pixel-by-pixel from a reference background image that is created by averaging images over time in an initialization period. The basic idea of background subtraction method is to initialize a background firstly, then by subtracting current frame in which the moving object present that current frame is subtracted with background frame to detect moving object. This method is simple and easy to realize, and accurately extracts the characteristics of target data, but it is sensitive to the change of external environment, so it is applicable to the condition that the background is known.

C. **Optical flow**

The optical flow method uses the motion target of the vector characteristics which changed with time to detect moving area in video [6]. It gives better performance under moving camera, but this algorithm is very complex and complicated computation and also it needs special hardware support, so it is difficult to meet the requirements of real-time video processing.

III.BACKGROUND SUBTRACTION METHOD

Moving Object detection and extraction from the fixed background in the analysed scene is mostly done by simple subtracting the current image and background image. This method is known as Background Subtraction method. The applied subtracting operation finds an absolute difference for each pixel, thus detecting objects (that have brighter or darker gray value), which usually differ from the background. If the difference is below a certain threshold, there is no change in the scene and the observed pixel is regarded as if it belongs to the background. Otherwise, there has been a change and the pixel belongs to the object.

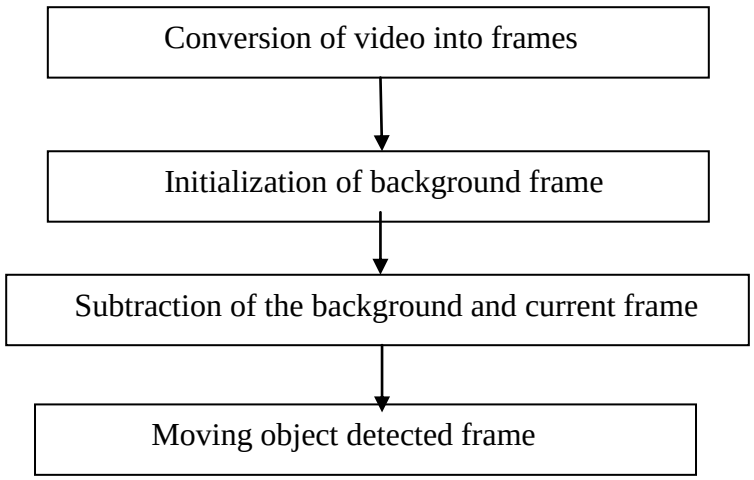

Figure 1: Brief of Background Subtraction Method

A. Frame Difference Method

The frame difference method is the simplest form of background subtraction [7][8]. In this method, the current frame is simply subtracted from the background frame. If the difference in pixel values for every pixel is greater than the threshold, then the pixel is considered part of the foreground otherwise it is consider as background. The Frame Difference method for background subtraction used for static camera.

B. **Approximate Median Method**

In this method, the median filtering buffers the previous N frames of the video [7]. Then, the background frame is calculated from the median of the buffered frame and the background is subtracted from the current frame to give the foreground pixel. The Approximate Median method checks whether the pixel in the current frame has a value that is larger than the corresponding background pixel. If that is the case, the background pixel is incremented by one. However, if the pixel in the current frame has a value that is smaller than the corresponding background pixel, the background pixel is decremented by one.

C. Mixture of Gaussian

This method uses a Gaussian probability density function to evaluate the pixel intensity value [8]. It finds the difference of the current pixel's intensity value and cumulative average of the previous values. So it keeps a cumulative average (μt) of the recent pixel values. If the difference of the current image's pixel value and the cumulative pixel value is greater than the product of a constant value and standard deviation then it is classified as foreground $|I - \mu| > k$ holds; otherwise, it can be considered as background, where k is a constant and is standard deviation.

IV. COMPARISON OF EXISTING MOVING OBJECT DETECTION TECHNIQUE

Below table show the comparative study of different Moving Object Detection Methods. Difference made on bass of techniques that are used in respective algorithms, advantages and disadvantages.

TABLE 1: COMPARISONS OF DIFFERENT MOVING OBJECT ALGORITHMS

Algorithm	**Advantages**	**Disadvantages**
Temporal differencing [6]	This method is simple and easy to implement. This is very adaptive to dynamic scene changes.	It generally fails in detecting whole relevant pixels of some types of moving objects. Additional methods need to be adopted in order to detect stopped objects for success of higher levels are computationally complex and cannot be used real-time without specialized hardware.
Background Subtraction [6][7][8]	This method is simple and easy to realize, and accurately extracts the characteristics of target data.	It is sensitive to the change of external environment, so it is applicable to the condition that the background is known.
Optical Flow [6]	It gives better performance under moving camera	this algorithm is very complex and complicated computation and also it needs special hardware support, so it is difficult to meet the requirements of real-time video processing.
Frame differencing [7] [8]	Easiest and simple method, It provides better results for static background.	It needs static background.
Mixture of Gaussian [8]	It require less memory. Perform good. It gives good result with quickly light levels.	It does not cope with multidimodal background.
Approximation Median [8]	It performs better as comparatively.	It requires buffer to store previous frames. It had a little problem with quickly changing light levels.

V. CONCLUSION AND FUTURE WORK

Moving object detection has widely been adopted by the industry or organization because of its broad applicability in real life this has been growing more and more. There are many existing methods like temporal differencing, background subtraction, optical flow etc. All having some merits and demerits. Central to these algorithms is the background subtraction method (including frame differencing, mixture of Gaussian and approximation median) is simple, easy and used in real-time applications and no need of using special hardware. But it is required to give better results to achieve a high accuracy.

In this paper, numerous proposed moving object detection algorithms have been compared on the basis of their advantages. But still some work need to be done to improve accuracy. In the next phase of our work, we will try to develop an algorithm which gives better results for moving object detection and we will compare their results with the existing algorithms.

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