A Review paper on Detection of Moving Object in Dynamic Background

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Abstract- Recent work in computer vision and image processing has increasingly focused on developing systems for monitoring humans and understanding their look, activities, and behaviour providing advanced interfaces for interacting with human beings, and developing sensible models of humans for various purposes. Moving target detection is a fundamental problem in computer vision, due to the features of moving target, such as strong speed degeneration, uncertain route, dynamic background, it becomes hard to detect moving object. The study on moving object in literature do not guarantee high precision and recall, so there is chance of improvement in detecting moving object in dynamic background with greater precision and recall.

I. INTRODUCTION

Moving target detection is a fundamental problem in computer vision [1]. Most object detection methods only detect the rough region of the target. Due to the impact caused by background, shadow, change of illumination, moving speed and so on, detection of moving target fails easily. In accordance with these problems, Conventional background modelling and subtraction methods have a strong hypothesis that the scenes are of static nature with limited perturbation. These methods will perform poorly in dynamic scenes [2].

This paper describes different techniques for detecting moving object either in static background or in the dynamic background. The problem with dynamic background is- if background is not static then proper foreground object can't be detected with accuracy (precision and recall). Most of the literature discussed in this paper considers the object detection in static background [2],[3],[8],[10].Some literature do not guarantee noise removal [2],[3],[4],[10] where some techniques works poorly for moving object accuracy[1].

Multiple moving object detection and removal is again vital [2]. Background detection gives poor performance if change in external environment [5], [6], [7].Some techniques also need huge number of calculation so speed of operation decreases [9]. As literature discussed in this paper has limitations there is chance of improvement in moving object detection in dynamic background.

II. LITERATURE REVIEW

Three-Frame Difference Algorithm Research Based on Mathematical Morphology [1]
In this paper a new method for moving target detection, that is improved frame difference. First of all, method detects moving target by three-frame difference, after getting binary image, the image is treated with erosion and dilation of mathematical morphology. With the difference of traditional approach is that, the structure elements of each time are selected according to the actual needs of binary image. This method has no constraints on the environment. This method can be used in many places. The most prominent feature of this method has less calculation, higher real-time performance and higher accuracy for moving target detection. A huge number of practical results show that, the technique in this paper has a strong application.

At the same time, although this method can detect the most of the contour of moving target, but still have some place to be missed. To analyze the reasons, there are two reasons. One cause is that there is small change in pixel value of moving target region, and the change just less than the threshold which is pre-set. These shortages need be improved.

A Moving Target Detection Algorithm Based on Dynamic Scenes [2]
This paper considers three major steps namely pre-processed, target detecting and finally is rectangular contour modelling. Firstly, pre-processed is the process of high-density data

acquisition in area where moving target may occur the most frequently with removing noise; Next, target detecting is the process of adopting a novel algorithm based on five-image difference algorithm and background subtraction algorithm; Lastly, rectangular contour model is the process of removing the cast shadow of a moving target in order to improve the precision of the detection.

But there are also shortcomings, it cannot eliminate such as leaves flutter noise and detect multiple moving targets. So we need other auxiliary method to improve in practice.

BSFD: Background Subtraction Frame Difference Algorithm for Moving Object Detection and Extraction [3]

In this paper firstly pre-treatment on the video pictures is done. It minimizes the error within the image process once. Secondly the paper focuses on the analysis and also the frame difference. This paper supported the background subtraction technique to enhance it and present a BSFD algorithm based on the background subtraction and the frame difference method.

Paper rectified the disadvantage of the background subtraction method and the frame difference method and proposed a dynamic updating of background image by frame difference method and utilizes the control of the background subtraction technique for detecting the moving object very effectively and accurately.

Problem with this method is does not consider noises from the image and also too many calculations are required to obtain a moving object. Dynamic background is also not considered in this paper.

Accurate Moving Target Detection Based on Background Subtraction and SUSAN [4]

Aiming at accurate target detection mission, this paper proposes a two-step accurate target detection framework which contains a rough target detection step using background subtraction and an accurate target detection step using an enhanced SUSAN edge detection method. After the precise target discovery, background in current frame is feedback to background estimation. This technique can detect precise target area in different noise level video frames robustly. The two-step technique planned in this paper can be used in the applications which require detecting the precise moving target.

This method does not consider dynamic background i.e. works poorly when the objects from the dynamic background are moving. Also does not considers noise from the image

Moving Target Detection algorithm using on the Dynamic Background [5]

In this paper, firstly, it has a concise beginning of pre-treatment of the video images. It reduces the error in the image processing. Secondly the paper focuses on analysis assessment of the two algorithms namely the background subtraction and the frame difference. Finally, this paper selects the background subtraction method to improve it and present a moving target detection algorithm based on the background which has dynamic changes.

The method is not robust and need to improve its target identification functions. Also does not consider noise from the image.

Motion Detection Based on Frame Difference Method [6]

The major aim of the research is to distinguish pixels belonging to the similar object. However, the present study is based on the following assumptions:

1. Properly fixed camera is important if you want to isolate motion.
2. Stable light, no flickering
3. Contrasting background
4. High camera frame rate and resolution

This technique can get the whole movement information and notice the moving object from the background better. The background subtraction technique is to use the difference method of the existing image and background image to detect moving objects, with simple algorithm.

This scheme is very responsive to the modifications in the external environment and has poor anti-interference ability.

Background Subtraction Using Running Gaussian Average and Frame Difference [7]

A new technique to fill small gaps that the foreground or the moving objects may control. Shadows and ghosts suppression aspect. This paper considers shadows as part of the background based on the assumption that the shadow is not strong, so we can eliminate it using an appropriate threshold during the background updating period. Running Gaussian Average method is summarized and Frame difference method is discussed in detail in this paper.

The main problem with this method is when a moving object stops; it will be quickly incorporated into the background. This may effect in object trailing when used to object tracking application. And how to further reduce the noise is also a challenging problem

Motion Detection and Tracking using Background Subtraction and Consecutive Frames Difference Method [8]

In this paper, a new approach is proposed to detect the motion using background subtraction and frame difference

method. A video monitoring and detection software is developed successfully, which provides an efficient method for surveillance purposes and it is aimed to be highly beneficial for any person or organization.

The system is adjustable to the camera movements. The problem with this method is dynamic background is not considered.

A New Moving Object Detection Method Based on Frame-difference and Background Subtraction [9]

In this paper, a new moving object detection method is proposed. This method which combines the idea of background subtraction and frame-difference has the following new features: 1) the method proposed can greatly fill the cavities of the foreground object and eliminate the noise because it is a fusion method; 2) the algorithm of image combination is introduced; 3) image repair and morphological processing techniques were took into the method to repair the moving objects.

Multiple videos test show that the proposed method can eliminate noise and fill cavities quickly, but the problem with this is speed of operation decreases.

A New Algorithm for Fast and Accurate Moving Object Detection Based on Motion Segmentation by Clustering [10]

This paper proposes a new algorithm based on a simple and reliable clustering method. This method is very fast, and could accurately segment motions. This method is applied on several videos from three public datasets.

The performance metrics including recall, precision and frame rate show that our algorithm performs better. The problem with this method is image noise and dynamic background is not considered.

III. ADVANTAGES AND DISADVANTAGES OF EXISTING APPROACHES

Table 1- Advantages & disadvantages of existing approaches

Title of Paper	Author/s	Advantage	Disadvantage
Three-Frame Difference Algorithm Research Based on Mathematical Morphology	1. Yanzhu Zhang 2.Xiaoyan 3.Wang, Biao Qum	1. Contour Drawing to object is Efficient 2.Less Calculations, 3.Higher accuracy of Target Detection	1.In this approach problem with pixel value of moving object so Moving object accuracy is reduced
A Moving Target Detection Algorithm Based on Dynamic Scenes	1.Huijuan Zhang, 2.Hanmei Zhang	1. Noise removal accuracy 2. Rectangular contour model captures moving object	1. This approach cannot eliminate such as leaves flutter noise and detect multiple moving targets
BSFD: Background Subtraction Frame Difference Algorithm for Moving Object Detection and Extraction	1. D Stalin Alex 2.Dr. Amitabh Wahi	1.Background detected accurately 2. Detection of the moving objects very effectively and accurately.	1. This approach does not consider noises from the image 2. Too many calculations are required to obtain a moving object
Accurate Moving Target Detection Based on Background Subtraction and SUSAN	1. Jun Zhang 2.Shukui Xu 3.Kuihua Huang 4.Tingjin Luo	1. This approach can detect accurate target area in different noise level video frames robustly	1.This approach does not consider dynamic background i.e. works poorly when the objects from the dynamic background are moving 2. Noise removal is poor
Moving Target Detection Algorithm Based on the Dynamic Background	1. Yangquan Yu 2. Chunguang Zhou 3. Lan Huang 4.Zhezhou Yu	1. Effective Background subtraction	1. The approach is not robust and need to improve its target identification functions
Motion Detection Based on Frame Difference Method	1. Nishu Singla	1. Efficient Foreground detection	1.This approach is very sensitive to the changes in the external environment 2.This Approach has poor anti-interference ability.
Background Subtraction Using Running Gaussian Average and Frame Difference	1.Zhen Tang 2.Zhenjiang Miao 3. Yanli Wan	1.Shadows are very efficiently processed and removed	1. This approach is when a moving object stops, it will be quickly incorporated into the background
Motion Detection and Tracking using Background Subtraction and Consecutive Frames Difference Method	1.Suresh D 2.Lavanya M P	1.The approach is adjustable to the camera movements	1. This approach works on static background
A New Moving Object Detection Method Based on Frame-difference and Background Subtraction	1. Jiajia Guo 2.Junping Wang 3. Ruixue Bai 4.Yao Zhang 5.Yong Li	1. This approach can greatly fill the cavities of the foreground object and eliminate the noise	1.The problem with this approach is speed of operation is slow
A New Algorithm for Fast and Accurate Moving Object Detection Based on Motion Segmentation by Clustering	1. Yachi Zhang 2.Guolin Li, 3.Xiang Xie 4.Zhihua Wang	1.This approach has better recall, precision and frame rate regarding moving object detection	1. Problem with this approach is image noise and dynamic background is not considered.

IV.   CONCLUSION AND FUTURE SCOPE

This review paper describes different techniques for detecting moving object in static and dynamic background. When we consider dynamic background speed of object, noise, shadows, moving leaves, cluttering are the major challenges that need to be encountered. In most of literature discussed in this paper do not guarantee accuracy (precision and recall) of detection of moving object with above parameters. The literature explained have advantages and disadvantages, so there is open scope for research in the area of moving object detection in dynamic background, There is need to built a robust object detection system which can work in dynamic background accurately to encounter all the parameters mentioned above.

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