

**A REVIEW ON DIFFERENT TECHNIQUES OF MOTION BASED OBJECT  
TRACKING SYSTEM**

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**Abstract** —Field of image processing consists of verity of operation like image recognition, image sharpening, image retrieval, video analysis, video processing and video quality enhancement etc. Video processing mainly concentrated on tracking the object or retrieving the object’s properties from sequence of images, which is called as “frames”. In this paper we are going to discuss about different object detection method, their advantages, limitations, assumptions etc. Gaussian mixture model (GMM) is one of those method used for object detection. GMM gives accurate result for detecting objects with some assumption. Existing work is also on the basis of this model. So, efficiency of object detection process can be improved by eliminating some of those assumptions.

**Keywords**-Gaussian mixture model, object detection, video processing

**I. INTRODUCTION**

In the area of image and video processing different algorithms and models are used for detecting object in different environment. They are classified on the basis of their efficiency, their performance, time/space complexity, LOC etc. In this paper we are going to discuss about Gaussian mixture model (GMM) used for object detection.

**1.1 Introduction of GMM**

GMM is density based model. It is most statistically model used for clustering. It is used for Recognizing object color, detecting object, classification of pixels etc. There are 3 layers of GMM, i/p, hidden & o/p layer. From the incoming frame pixel value is determine and uses as i/p of GMM i/p layer. Value of that pixel used to classify the pixel and calculate conditional probability, probability of pixel comes under particular class. Finally o/p layer gives class label of cluster. Weight updates performed based on pixel value. [From the previous frame to next frame][4].

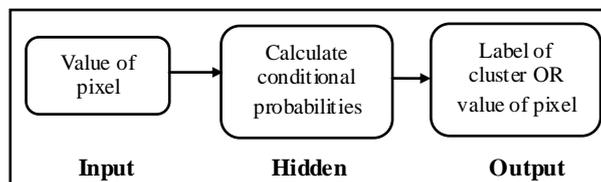
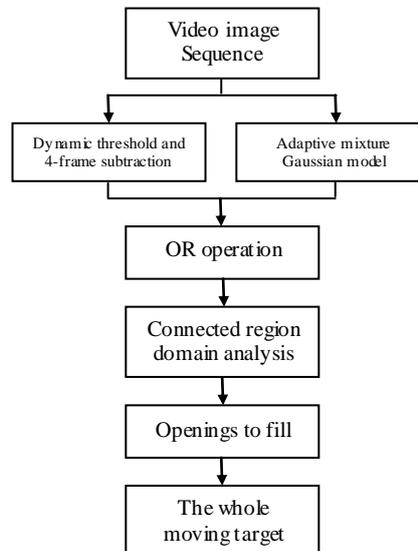


Figure 1: GMM Layers

**II. LITERATURE SURVEY**

**A.** In 2013, Qinghua Ji and Suping Yu present Motion Object Detection Based on Adaptive mixture Gaussian model & four frame Subtraction [1]. In this paper, adaptive GMM is used for detecting moving target. Classical GMM has the limitation of object detection in complex scene. There for they combine adaptive GMM & four frame subtraction method. Algorithm accepts video as a sequence of an image, combination of four frame method and GMM used for processing those images. From the video sequence four frames are selected to be read. Then image are subtracted in to 2, and then and operation performed to determine whether it is foreground image or background image. GMM does its regular work of detecting object. Domain analysis checks that result falls under which domain. Shadow, small noise etc. are filled by hole filling algorithm and finally get, moving target.

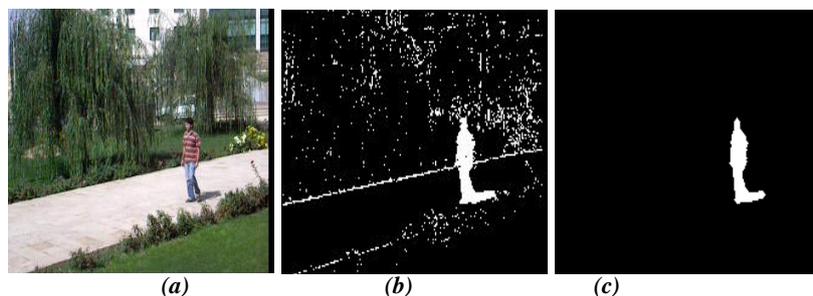
Although background subtraction[6] and frame difference method are common algorithms for target detection ,the two methods have their specific environment for using .The proposed method integrates these two methods putting forward a moving object detection algorithm which combines adaptive Gaussian mixture model with four frame difference based on dynamic threshold. This efficient method is presented, not only effectively overcoming the influence of illumination mutate but also solving the problem of double image. In this way, it is able to better detect the moving targets.



**Figure 2: Flow of adaptive mixture Gaussian model and four frame subtraction**

**B.** In 2009, Saeid Fazli, Hamed Moradi pour and Hamed Bouzari present Multiple Object tracking using improved Gaussian mixture model [2]. Human tracking in dynamic scenes has been an important topic of research. This paper presents a novel and robust algorithm for multiple motion detection and tracking in dynamic and complex scenes. The algorithm contains of two steps: at first, we use a robust algorithm for human detection. Then, Gaussian mixture model (GMM), Neighbourhood-based difference and Overlapping-based classification are applied to improve human detection performance. The conventional mixture Gaussian method suffers from false motion detection in complex backgrounds and slow convergence[7]. We combine three above mentioned methods to obtain robust motion detection. The second step of the proposed algorithm is object tracking framework based on Kalman filtering which works well in dynamic scenes. Experimental results show the high performance of the proposed method for multiple objects tracking in complex and noisy backgrounds.

In this paper, GMM is improved for detecting multiple objects. This improvement done in 2 steps. First robust algorithm for human detection is used and then use of GMM. Conventional GMM suffers from false motion detection in snowy OR windy conditions. To overcome this limitation, improved GMM was introducing for multiple object tracking.

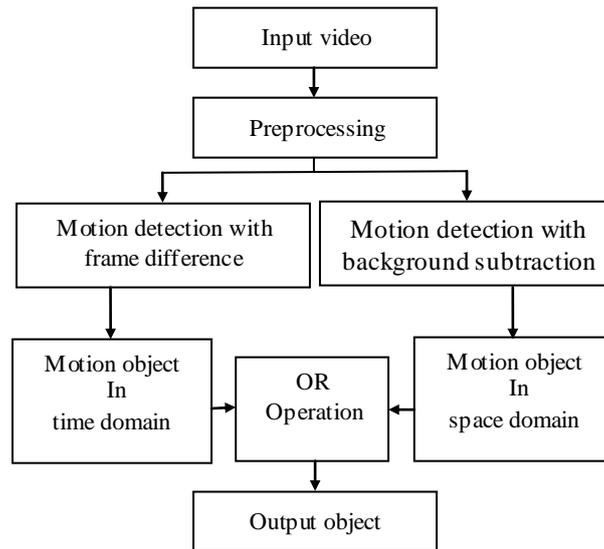


**Figure 3: (a) Original frame (b) GMM result (c) result of proposed method**

This paper presents a hybrid method that combines Gaussian Mixture Model, Neighbourhood-based difference and Overlapping-based classification algorithm for motion detection in dynamic and complex background. The proposed method provides robust detection for moving objects in dynamic video sequence. Multiple object tracking is performed using Kalman filter. The algorithm is able to automatically detect and track different objects in the scene without any prior knowledge. Robustness of the proposed combined method is shown by some experiments [2].

**C.** In 2013, Yu Xiaoyang, Yu Yang, Yu Shuchun, Song Yang, Yang Huimin & Liu Xifeng present A Novel Motion Object Detection Method Based on Improved Frame Difference and Improved Gaussian Mixture Model [3]. The existing motion detection methods include background subtraction and frame difference. But it is prone to exist some holes with frame difference method and it is difficult to build background model[8] using background subtraction method. So the test results did not achieve the ideal state.

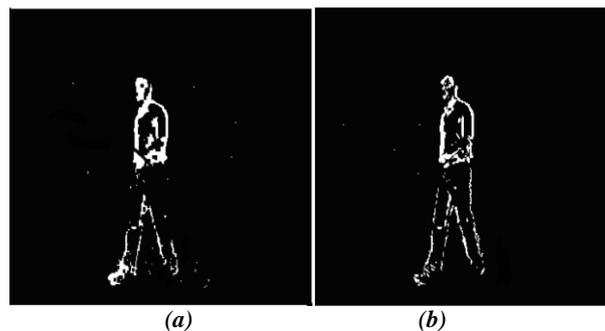
Aim at these problems, this paper combines frame difference method improved by motion history image with background subtraction method based on improved Gaussian mixture model to detect the motion object. The experimental results show the method has achieved a satisfactory effect. In this paper, for object detection frame difference method and background subtraction method are used. Combination of this two method helps to improve efficiency of object detection. Pre-processing divides video into sequence of frame. Frame difference is the most efficient method for human motion detection, because it calculates the motion in to the frame. In this frame human makes large amount of motion compare to background. So, that difference makes algorithm to detect human.



*Figure 4: flow of motion detection system*



*Figure 5: frames form original video*



*Figure 6: (a) result of frame difference (b) result of improved frame difference*

In this paper, proposed a novel method combines frame difference with background subtraction to detect the motion object in the video with a stable background. In the algorithm, the improved frame difference was used to detect the motion object in the time domain and the improve background subtraction was used to detect the motion object in the space domain. Finally, the two parts were combined to obtain the complete motion object. The algorithm has processed a lot of videos and obtained satisfactory results.

### III. COMPARISON

In all above methods GMM was improved by using another object detection method with it. But the common assumption in all method is the camera condition.

**Table 1: Object and camera condition considered or not**

<b>possibilities of object and camera condition</b>	<b>4 frame subtraction with GMM</b>	<b>Human detection algorithm with GMM</b>	<b>Frame difference method with GMM</b>
both are static	✓	✓	✓
object moving camera static	✓	✓	✓
camera moving object static	✗	✗	✗
both are moving	✗	✗	✗

In the process of object detection there are multiple possibilities between object and camera which is listed in above table. Those methods give results with less accuracy if it tested under the following conditions.

#### **IV. CONCLUSION**

In existing system, Aim of using Gaussian mixture model with other image processing techniques is to track an object efficiently. GMM with background subtraction method used to detect object which is in motion [3]. Same as GMM with human detection algorithm improves the result of motion detection [2]. Existing work shows that how object can be detected using GMM. And result shows accuracy of GMM. But the most common limitation of GMM is camera condition. So by eliminating that assumption and make system works under dynamic camera condition improves the efficiency of motion based object tracking system.

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