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Foreground Moving Object Detection Using Background Subtraction

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Abstract: *The segmentation/Detection of a moving object is oneof the important step in computer vision application, such asremote sensing, medical imaging, traffic surveillance,machine/robot vision, microscopic imaging etc. In this paper"Gaussian Mixture model" for backgroundsubtraction/foreground detection has been applied whichcomputes a foreground mask on a moving object (which is eitherthe color video frame or series of a gray scale image). The blobanalyzer has also been used to calculate statistics of identifiedregion in a binary image. The result shows that the proposedalgorithm can detect the moving object effectively while occludedby the box.*

Keywords -*Background Subtraction, Blob Analysis,Gaussian Mixture Model.*

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I. INTRODUCTION

In computer vision application the real time segmentation ofa moving object is an important step. The segmentation of amoving object involves "Background Subtraction". Thedetection of a moving object for a human being is quite easywhile for a machine/computer it is a difficult task. So it isimportant to develop an algorithm which is quite adaptable andcan be easily implementable [1]. The Background Subtractionmethod is chosen for the real time segmentation of a movingobject because it is one of the important/popular method. Thedetection of a moving object is obtained from the differencebetween the current frame & the reference frame orbackground image. There is a various application ofbackground subtraction in computer vision which provide veryimportant prompts [2]. For Foreground detection;current frame ─ Background model > Threshold. The threshold value is chosen such that it will reduce theerroneous values [3], [4].

Background modeling consists of two important majorsteps:

1) Background Initialization
2) Background Update

In background initialization, the Initial model of thebackground is calculated while in background update the model is updated such that it will adapt the various changes inthe scene.There are some difficulties which arise while performing theBackground Subtraction and needs to be taken into consideration:

- Gradual & Sudden illumination changes
- Motion changes due to Camera oscillation, highfrequency background, another objects(such as tree, branches ,sea etc.)
- Shadow
- Changes in Background geometry[5]

II. RELATED WORK

The Background subtraction methods have found differentways to dealing with these type of problems [6]. When we areabout to model the background it is very important that thebackground model should be adaptable towards the variouschanges in the frames. The background model should adjustitself such that it will reduce the difficulties arising as statedabove. Due to illumination changes there is a problem forbackground modeling. Authors in reference [7] developed amethod where every pixels of the background is modeled withKalman filter such that it works well in the illuminationchanges. Gaussian mixture model is a great model used todetermine that the pixel whether it belongs to background ornot. Sometime the detection of a moving object become quitecomplex due to presence of noise in the scene. The researchershave developed many ways to reduce noise. Mostlymorphological operations are used for the reduction of noisebecause it is one of the popular method for noise reduction [1],[8].The modeling of the Background is one of the importanttask when we are trying to detect the moving object. When thescene of the background is not stationary or it is muddled

thenit becomes quite difficult to choose a perfect background. Forthis type of situation we have to use non-parametric model forbackground [9]. The non-parametric model can rapidly adjustthe changes in the scene which helps in the complex detectionof the moving object [10]. The detection of moving objectwhen it is seen properly in all frames of a video is easy ascompared to the detection of the object which is occluded insome frame of video. So there are different algorithms for thedetection of moving object when it is occluded or not occluded[11]. This paper deals with the detection of moving objectwhen it is occluded in some frames of a video.

This paper is organized in the following sections. Section III deals with proposed algorithm, section IV describes work flow of the proposed method, section V presents the results of the proposed method, section VI presents the summary of figures and sectionVII shows the conclusion of the algorithm. For the detection ofmoving object we took an example video from MATLAB 2016a.

III. PROPOSED METHOD

The proposed method consists of the following steps:

1. Averaging:

Averaging is one of the important step in computer visionapplication because it reduces noise. Basically it accumulatesthe image pixel that computes the average value of the pixel inthe given set of images. This is a influential noise reductiontechnique that has power to reduce noise while simultaneouslyit also estimates the feature. Image averaging actuallyincreases the Signal to Noise ratio (SNR) of an image such thatit reduces the noise or high frequency image component isfiltered out.

The block diagram of the proposed method is shown in figure1.

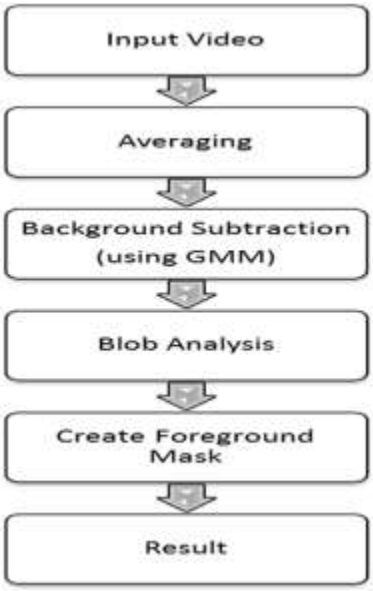

Figure 1: Block diagram of the proposed method

2. Background Subtraction using GMM

A Gaussian Mixture Model is a parametric probabilitydensity function which is a weighted sum of Gaussian component densities & given as:

$$p(X/\lambda) = \sum_{i=1}^{M} w_i g(X/\mu_i, \Sigma_i) \qquad (1)$$

where ' X ' is an n-dimensional continuous value data, $w_i$isthe mixture of weights for i= 1 to M.

A Gaussian Mixture Model is used for modeling of thebackground is because it is one of the greatest model forbackground modeling. It models all different type of pixels[12], [13].

3. Blob Analysis

The blob analysis is one of the important step for thedetection of moving object. Basically it recognize the movingobject in a scene. It works on a binary image & stands for"Binary Large Object". After using this we can understand thatthe large connected moving pixels is our target & the smallconnected pixel is not of our interest (because these are noise)[14], [15]

IV. WORK FLOW OF THE PROPOSED METHOD

In this section of the paper, we describe the work flow of theproposed algorithm. In this section first of all an input videowhich is of 380kB in size & having 508px*362px of a frame isfetched. After this operation averaging of the fetched imagewhich reduces the noise in the given image is computed. Forthis purpose 3*3 averaging box filter has been used. After thisprocess, we applied an important method "BackgroundSubtraction" using Gaussian Mixture Model. After thisoperation a noise free foreground image has been obtained.Having noise free foreground image we have applied blobanalysis which estimates the large cluster pixels value of theimage which is of our interest. When blob analyzer estimatesthe large cluster pixel image then a mask is headed on thatpixels and consequently the moving object is detected.

V. RESULTS

In this section the detection result of a moving objectoccluded by the box have been shown. The proposedalgorithm is implemented in MATLAB 2016a. The input videois of 380kB in size and having frame rate 15 frame/sec.

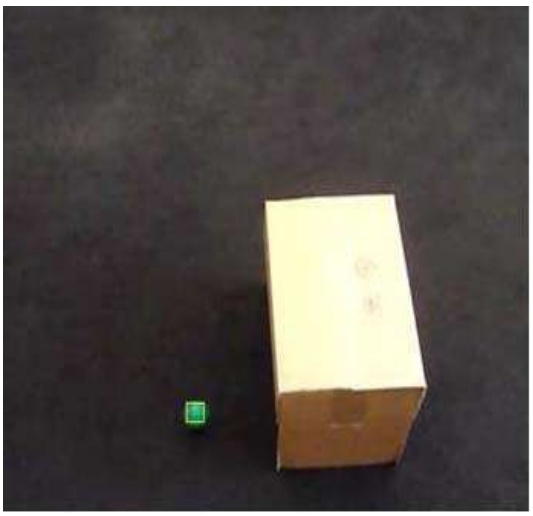

Figure 2: Input Image

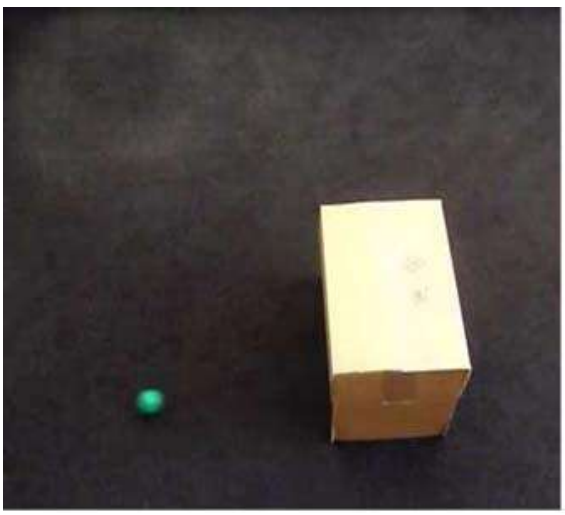

Figure 4: Detected ball before occlusion

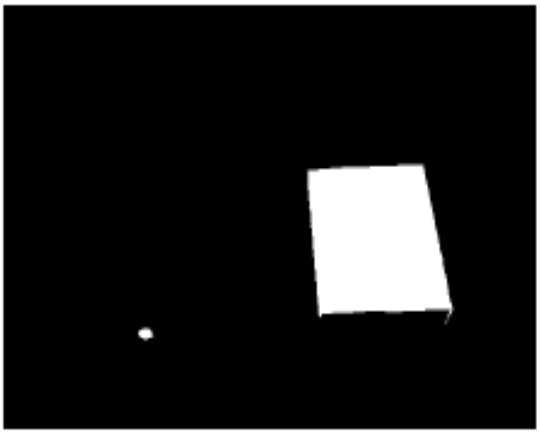

Figure 3: Foreground Image (Noise Free)

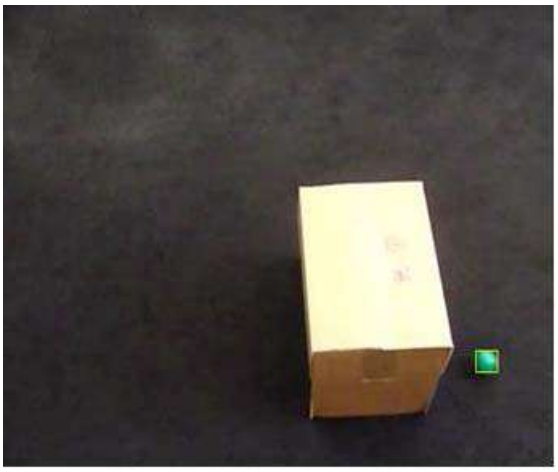

Figure 5: Detected ball after occlusion

Each frame is of 508px*362 px. In this simulation the no.of initial video frame for training the background model istaken as 1000, the threshold is chosen as 0.7, number ofGaussian modes in mixture model

is 5 & variance forinitializing the new Gaussian mode is taken as 1000*1000 &the minimum blob area is taken as 100.

VI. Summary Of Figures

I have inserted four figures of simulation result. Figure 2 isthe 21st frame of the input video which is fetched in MATLAB 2016a successfully. Figure 3describes the foregroundimage of the frame which is obtained after backgroundsubtraction using Gaussian mixture model. Since my objectiveis to detect the moving object so my concentration is on onlythe moving ball not on the box so I used blob analyzer whichworks on binary image and keep the cluster of moving pixel ofthe image and then using bounding box a rectangular box isdrawn over moving object. Figure 4shows the detection ofmoving object before occlusion while Figure 5shows detectionof moving object after occlusion.

VII. CONCLUSION

From the above results it is concluded that the backgroundsubtraction is one of the important step for the detection ofmoving object. The result also shows that the backgroundsubtraction gives satisfactory result for the detection of themoving object while it is occluded.

References

[1]. Stauffer, Chris, and W. Eric L. Grimson. "Adaptive background mixturemodels for real-time tracking," Computer Vision and PatternRecognition, IEEE Computer Society Conference on. Vol. 2. IEEE, 1999.

[2]. Olugboja, Adedeji, and Zenghui Wang. "Detection of Moving Objectsusing Foreground Detector and improved morphological filter,"Information Science and Control Engineering (ICISCE), 3rd InternationalConference on IEEE, 2016.

[3]. Vahora, Safvan, Narendra Chauhan, and NileshPrajapati. "A robustmethod for moving object detection using modified statistical meanmethod," International Journal of Advanced Information Technology 2.1:65. 2012

[4]. Bobick, Aaron F., and James W. Davis. "The recognition of humanmovement using temporal templates," IEEE Transactions on patternanalysis and machine intelligence 23.3: 257-267. 2001

[5]. Rajan, P., and Dr S. Prakash. "Moving Foreground Object Detection andBackground Subtraction Using Adaptive-K GMM: A Survey,"IJARCSMS, ISSN: 2321 7782, 2014.

[6]. Haritaoglu, Ismail, David Harwood, and Larry S. Davis. "W4: real-timesurveillance of people and their activities," IEEE Transactions on patternanalysis and machine intelligence 22.8: 809-830. 2000.

[7]. Ridder, Christof, Olaf Munkelt, and Harald Kirchner. "Adaptivebackground estimation and foreground detection using kalman-filtering,"Proceedings of International Conference on recent Advances inMechatronics, 1995.

[8]. YumnahHasan, Muhammad UmairArif, Amad Asif and RanaHammadRaza, "Comparative analysis of vehicle detection in urban trafficenvironment using Haar cascaded classifiers and blob statistics." FutureTechnologies Conference (FTC). IEEE, 2016.

[9]. Piccardi, Massimo. "Background subtraction techniques-a review,"Systems, man and cybernetics, 2004 IEEE international conference on.Vol. 4. IEEE, 2004.

[10]. Elgammal, Ahmed, David Harwood, and Larry Davis. "Non-parametricmodel for background subtraction," European conference on computervision. Springer Berlin Heidelberg, 2000.

[11]. Iraei, Iman, and Karim Faez. "Object tracking with occlusion handlingusing mean shift, Kalman filter and Edge Histogram," PatternRecognition and Image Analysis (IPRIA), 2015 2nd InternationalConference on. IEEE, 2015.

[12]. H. Zhou, H. Kong, J.M Alvarer, D. Creghton and S. Nahavandi, "Fastroad detection and tracking in aerial videos," Intelligent VehiclesSymposium Proceedings, IEEE, 2014.

[13]. Rother, Carsten, Vladimir Kolmogorov, and Andrew Blake. "Grabcut:Interactive foreground extraction using iterated graph cuts," ACMtransactions on graphics (TOG). Vol. 23. No. 3. ACM, 2004

[14]. Hailing Zhou, Lyndon Llewellyn, Lei Wei, Doug Creghton and SaedNahavandi, "Marine object detection using background modelling andblob analysis," Systems, Man, and Cybernetics (SMC), InternationalConference on. IEEE, 2015.

[15]. Chantakamo, Anchisa, and MahasakKetcham. "The multi vehiclerecognition using hybrid blob analysis and feature-based," InformationTechnology and Electrical Engineering (ICITEE), 7th InternationalConference on. IEEE, 2015.

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