International Journal of Mathematics and Physical Sciences Research ISSN 2348-5736 (Online)
Vol. 6, Issue 1, pp: (99-105), Month: April - September 2018, Available at: www.researchpublish.com

Moving Objects Tracking Established On Background Extraction Using Two Image Sequence and Single Gaussian Method

Ahmed Mahgoub Ahmed Talab

ElimamELMahdi University, Deportment of Mathematics, Kosti, Sudan

Abstract: **Background extraction is a crucial step in many automatic video content analysis applications. In this articled, we recommend a new tracking method that uses two image sequences and single Gaussian method to approach the tracking of an object. The two image sequence is the use of a series image subtraction. The single Gaussian method consists of single Gaussian distributions, the average, standard deviation and weight. This paper combined the single Gaussian method and two image sequence object tracking. The proposed method was compared with different methods used in the field; the comparison clearly shows that the method is reliable, quickly and precise. This method has the advantage that it is fast and successfully tracks the objects and extract's background image, also no shadow and noise was associated with the application for the approach. Empirical work shows that our method is enhanced relatively to the other widely used techniques.**

Keywords: **Background extraction, Single Gaussian method, two images Sequence, Objects tracking.**

I. INTRODUCTION

Video sequence's analysis is presently employed for a solution of a wide scope of problems in several application systems, such as video surveillance and access Security systems, control systems, automatic systems in traffic tracking, and other systems [1-10]. Credible detection of moving objects in a sequence of images is an essential part in many computer vision systems [2-8]. Generally Automated visual surveillance system starts with detection of moving objects from the scene with the assumption that nothing might happen in non moving areas [5-13]. Extraction of detect moving objects is an essential and important research topic of the surveillance system [6-12]. In the Intelligent Transportation System, the Detection of moving objects from image sequences is an important step [7-10]. Moving objects, results control the efficiency and accuracy of continuous image processing. In the Intelligent Transportation System, the camera is mounted, the most expeditious and exact algorithm of moving objects detection is a background subtraction algorithm. However, the background extraction algorithm dominates the expeditious and accuracy of background subtraction.

Clearly, if there is a scene frame with no moving object in the image sequences, it used as a background frame. However, in the real world, it is not easy to get a simple background image. Thus, in such systems as in many other applications, a critical issue in this process extracted the pure background image from the videos which include moving objects [7-17].

In this article, we use single Gaussian method, and two image sequences are combined. Single Gaussian approach can be applied within the context of a complicated environment; the two image sequence is used by the time difference of two consecutive images, and by adapting the threshold to extract an image of the moving area. The two image sequences have the properties of quickness and exact position because of using current image, but the flaw is that it depends on the difference of environment [8-19]. This algorithm two image sequences are sensitive to moving objects, and has reliance with light because of the stumpy interval between two images. For more composite background, is not easy to track moving objects, the inner image will produce an empty phenomenon. Its influence alone is not a complete method [9-21]. Presently, the research literature offers many kinds of background models; the conventional Gaussian mixture model uses a mixture of the K Gaussian model distribution of background pixels that will be the scene to Institute the statistical model for each pixel, and periodically update the background [4-22]. The Gaussian model based on the screen to be pure only when the background images with each pixel to calculate the mean and standard deviation, and the future outlooks of the background information as a basis for classification [5-9].

II. ALGORITHMS

A. Tow image sequence:

The Two consecutive images are the rule of continuously time subtracting image pixels. The feature of this detection method is its insensitive to light changing; its ideal performance in dynamic situation; it's simple operation and its location precisely of moving object. The formal image subtraction approach is defined by subtracting the former image from the current image to obtain motion data. In this paper we take, two successive images were $I_n(x,y)$,$I_{n+1}(x,y)$, and the Difference between two images calculated formula is used.

$$D(x,y)=\left|I_{n+1}(x,y)-I_n(x,y)\right| \quad \forall(x,y)\in [1,N]\times[1,M] \qquad (1)$$

Using a suitable threshold Ton D(x, y), this threshold can remove noise, and can be set for different light conditions, and then we set the threshold conditions for special number 10.

B. SingleGaussianModel:

The Single Gaussian model is a stretch of the Gaussian probability density function. The Single Gaussian model can estimate any smooth shape of the density distribution, frequently used in image processing for good results. Suppose of Single Gaussian model consists of and the blending of Gaussian probability density function; the Gaussian probability density function of each has its own mean, standard deviation, and weight. The weights can be construed by the corresponding Gaussian model of the frequency. They more frequently seem in the Gaussian model the higher the weight. The higher frequency of happening then to find the maximum weight on the Gaussian probability density function, finally, the Gaussian probability density function of the means pixel value is the background image [11-22].

Background model:

Background extraction is one of the most important approaches of object segmentation. This process contains two steps: background and update model. The basic theory of the Single Gaussian model is as the number of Gaussian in this paper the number of Gaussian is solitary , an absolute distribution can be in any of the accuracy is mixed with a weighted average of these Gaussian approximation[23-33].

$$P(X_t)=\sum_{i=1}^{K}\omega_{i,t}*\eta(X_t,\mu_{i,t},\sum_{i,t}) \qquad (2)$$

Where k is the number of distributions in this paper k is unique, $\omega_{i,t}$ is an estimate of the weight, $\mu_{i,t}$ is the mean value, $\sum_{i,t}$ is the covariance matrix, and where η is a Gaussian probability density function

$$\eta(X_t,\mu_{i,t},\sum_{i,t})=\frac{1}{(2\pi)^{\frac{\pi}{2}}\left|\sum\right|^{\frac{\pi}{2}}}e^{-\frac{1}{2}(X_t-\mu_t)^T\sum^{-1}(X_t-\mu_t)} \qquad (3)$$

These parameters determine the characteristics of this density function, such as the center of the function shape, width and direction and so on.

Background update:

The recognized algorithms, if not updated, the step operation times will be very long. We must use the iterative aspect method to update the mean, standard deviation and the weight to reduce the time required. New steps before must set the basic parameters, as we select the number of Gaussian components $C=1$, Number of background components are $M=1$, Positive deviation threshold $D=2.5$, learning rate between 0 to 1 , in this paper we set $\alpha=0.01$, foreground threshold 0.4 . The weight, mean and standard deviation are updated by using equations [23-33].

$$\rho=\frac{\alpha}{W_{i,j,k}} \qquad (4)$$

$$W_{i,j,k} = (1-\alpha) \times W_{i,j,k} + \alpha \quad (5)$$

$$\mu_{i,j,k} = (1-\rho)_{i,j,k} + \rho * \mathrm{I}_n \quad (6)$$

$$\sigma_{i,j,k} = \mathrm{sqrt}\left[(1-\rho) \times \sigma^2{}_{i,j,k} + \rho \times (I_n - \mu_{i,j,k})^2\right] \quad (7)$$

However, the calculative involvement of the Single Gaussian method is high, but provide better results. If novel entrants cannot be matched to any pixel of a Gaussian probability density function, update the pixel value of mean, then initialize the weights and the standard deviation.

III. THE PROPOSED METHOD

The objective of this paper is to propose a new method to obtain background and foreground image from moving video, because most of the current methods are suffering from ineptitude of image extraction, the extracted image most of the time featured by shadow and need more space memory devices. The proposed method used the Single Gaussian method and Two Image Sequence then we can obtain the results of two different images, we have to combine the advantage of Single Gaussian method and two images Sequence. We use the single Gaussian method approach as the main algorithm and the other algorithms as auxiliary.

A. Calculation of the background:

1- For the proposed method after initialize model if the number of frames is less than special value we use the learning rate to compute the initial background. If the number of frames is greater than or equal to special value the learning rate is used to update the background image computation; the following computing formula is used:

$$BG(i,j) = \begin{cases} 0 & \text{if } \mathrm{d}_n(i,j) < T \\ 1 & \text{Otherwise} \end{cases} \quad (8)$$

2- Detect pixel is If pixel is background, we will update this pixel model and using this pixel.

3-Detect background and foreground in Single Gaussian Method According to this formula:

$$BG(i,j) = \begin{cases} 0 & \text{if } \left|I(i,j) - proposed(i,j)\right| \le D * sd(i,j) \\ 1 & Otherwise \end{cases} \quad (9)$$

B. Calculation of the foreground

1- Use two serial images separated by fixed interval, $I_n(i,j)$ and $\mathrm{I}_{n+1}(i,j)$ respectively, were changed in to Gray image for simple and real time.

2-Using $I_n(i,j)$ and $\mathrm{I}_{n+1}(i,j)$ we can get difference image $D_n(i,j)$ .According to equation (1) and results in a binary image that classifies all pixels into two categorizations (foreground and background).

$$BG(i,j) = \begin{cases} 0 & \text{if } \mathrm{D}_n(i,j) < T \\ 1 & \text{Otherwise} \end{cases} \quad (10)$$

3-comparing the value pixels in $BG(i,j)$ in equation (9) and $BG(i,j)$ in equation (10), we determine the foreground of proposed method according to this formula:

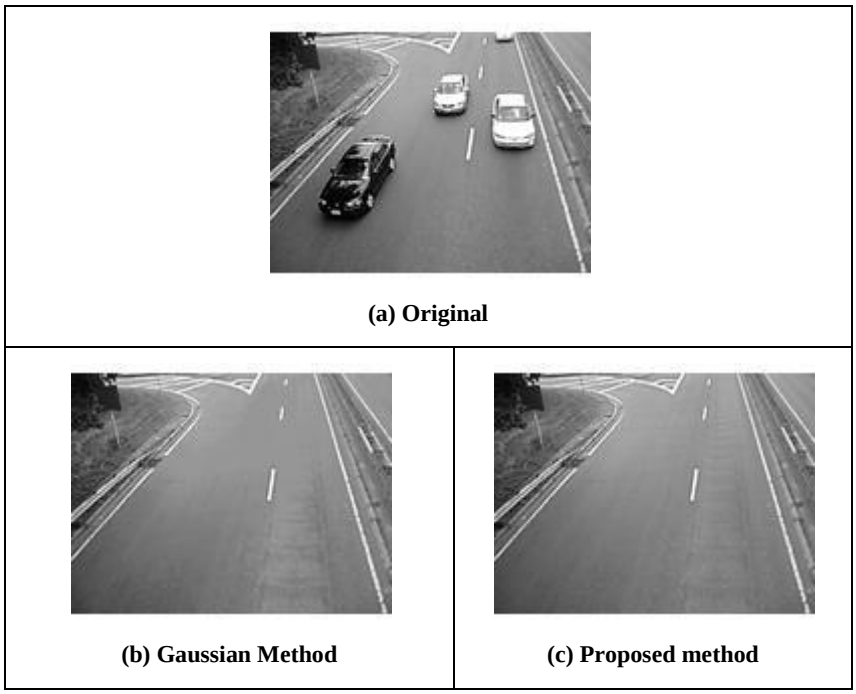
$$FG(i,j) = \begin{cases} 1 & \text{if (fg in (Eq(9)} \wedge Eq(10)) \\ 0 & Otherwise \end{cases} \quad (11)$$

4-The use special filters of image processing in the computed foreground were found and then the components with size less than the certain threshold were removed.

Through the steps above, the background and foreground can be extracted correctly.

IV. EXPERIMENTAL AND RESULTS

We show experimental result of the article object tracking method. The proposed method was implemented in MATLAB. (R2012 b) and tested in windows 8 with Intel (R) core (TM) i7-3632QM CPU @ 2.20 GHz 2.20 GHz with a memory of 4GB. The object video sequences come from MATLAB (traffic.mj2) which is publicly available; the size of the video sequences is 120 × 160 pixels Fig. 1. The video is clear and showed many different types of algorithm. Figure 1 showed that vehicle tracking results.



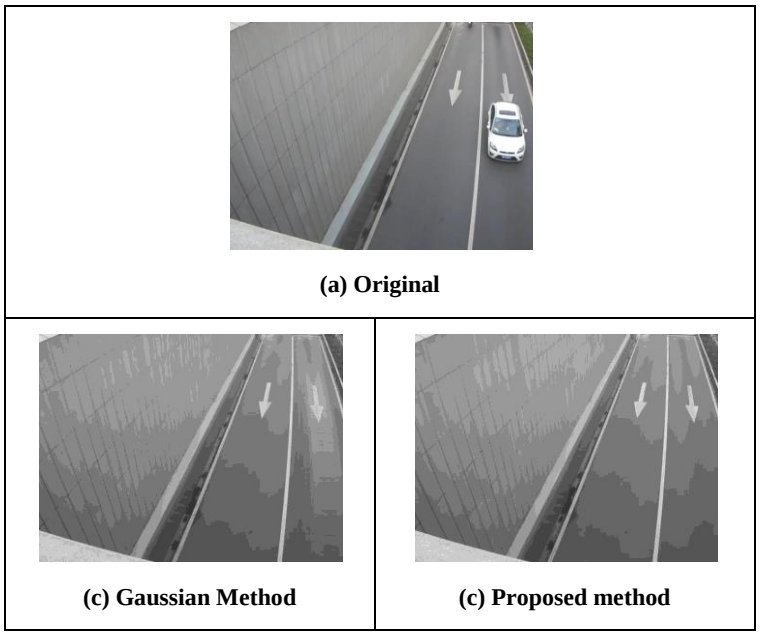
(a) Original

(b) Gaussian Method

(c) Proposed method

Fig. 1: Background extraction based on different methods from another data

The results of experiments under the same conditions are shown Fig. 1. 1c resulted from proposed method and its quality is worse than in Fig.1b.The result of proposed background extraction showed in Fig. 1 and the moving car is almost eliminated in this image. The advantage of the proposed method is also proved. Thus, it is proven that the proposed method in this study has a better quality than others.



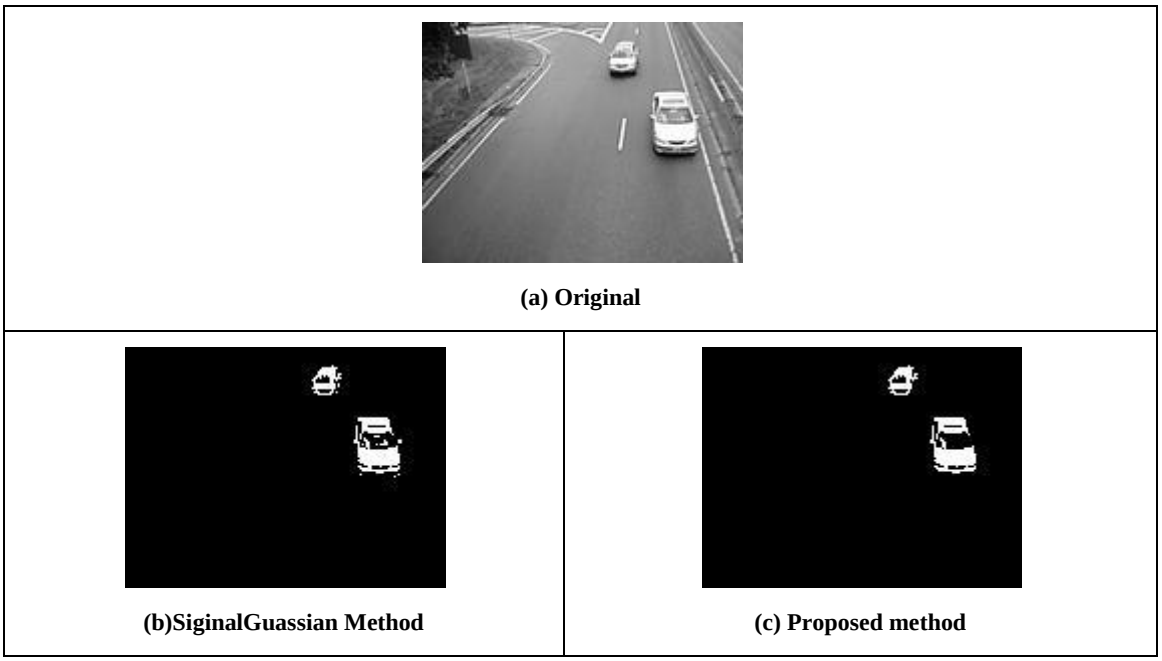
(a) Original

(c) Gaussian Method

(c) Proposed method

Fig. 2: Background extraction based on different methods from another data

The results of experiments under the same conditions are shown Fig. 2.The result of proposed background extraction showed in Fig. 2 and the moving car is almost eliminated in this image. The advantage of the proposed method is also enhanced. Thus, it is proven that the proposed method in this study has a better quality than others.



(a) Original

(b)SiginalGuassian Method

(c) Proposed method

Fig. 3: Foreground extraction based on different methods from another data.

The results of experiments under the same conditions are shown Fig.3. This clearly showed that our method is better quality another method; because the proposed method is no shadow.

V. CONCLUSION

In this article, we propose single Gaussian method and two image series successfully applied in a continuous image. We used single Gaussian method approach as the main tracking algorithm and the two image sequence method to subtract successive images, also used to special filter image to remove noise. The experimental results of the article method in this article successfully extract background and foreground image. The experimental results are accurate and no noise and shadow was associated with all extracted images.

ACKNOWLEDGMENT

The author would like to thank all brothers in University ofElimamELMahdi University in gratefully appreciates Musaab O. El-Faroug' for his assistance within the research.

REFERNCES

[1] Bazzani, L., D. Bloisi and V. Murino, 2009. A comparison of multi hypothesis kalman filter and particle filter for multi-target tracking. Proceeding of the Performance Evaluation of Tracking and Surveillance Workshop at CVPR, pp: 47-54.

[2] Bondzulic, B. and V. Petrovic, 2008. Multisensor background extraction and updating for moving target detection. Proceeding of the 11th International Conference on Information Fusion, pp: 1-8.

[3] Fan, Y., 2005. A real-time algorithm of dynamic background extraction in image sequence. Proceedings of the International Conference on Machine Learning and Cybernetics. Guangzhou, China, 8: 4997-5000.

[4] Kravchonok, A., 2012. Region-growing detection of moving objects in video sequences based on optical flow. S. Mach. Perc., 22: 244-255.

[5] Meijin, L., Z. Ying and H. Jiandeng, 2009. Video background extraction based on improved mode algorithm. Proceedings of the 3rd International Conference on Genetic and Evolutionary Computing (WGEC'09), pp: 331-334.

[6] Wang, L. and N.H. Yung, 2010. Extraction of moving objects from their background based on multiple adaptive thresholds and boundary evaluation. IEEE T. Intell. Transp., 11: 40-51.

[7] Wu, J., Z.M., Cui, H.J. Yue and G.M. Zhang, 2012. Semantic analysis of traffic video using image understanding. J. Multimedia, 7: 41-48.

[8] Yang, Y.Z., X.F. He, Y.Z. Chen and Z.K. Bao, 2008.Traffic parameter detection based on video images [J]. Control Eng. China, 3: 36.

[9] Yang, J., R. Stiefelhagen, U. Meier and A. Waibel,1998. Visual tracking for multimodal human computer interaction. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM Press/Addison-Wesley Publishing Co., New York, pp: 140-147.

[10] Ahmed Mahgoub Ahmed Talab, Zhangcan Huang and Xiong Jiang,2014, Video Background Extraction Using Improved Mean Algorithm and Frame Difference Method, Research Journal of Applied Sciences, Engineering and Technology 7(22): 4795-4800, 2014.

[11] Barnich, O. and M. Van Droogenbroeck, 2009. ViBe: Apowerful random technique to estimate thebackground in video sequences. Proceeding of IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2009), pp: 945-948.

[12] Barron, J.L., D.J. Fleet and S.S. Beauchemin, 1994. Performance of optical flow techniques. Int. J. Comput. Vision, 12(1): 43-77.

[13] Bazzani, L., D. Bloisi and V. Murino, 2009. Acomparison of multi hypothesis kalman filter and particle filter for multi-target tracking. Proceeding of Performance Evaluation of Tracking and Surveillance Workshop at CVPR, pp: 47-54.

[14] Chen, S.W., L.K. Wang and J.H. Lan, 2011. Moving Object tracking based on background subtraction combined temporal difference. Proceeding of International Conference on Emerging Trends in Computer and Image Processing (ICETCIP), Babgkok.

[15] Comaniciu, D., V. Ramesh and P. Meer, 2000. Realtime tracking of non-rigid objects using mean shift. Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, pp: 142-149.

[16] Hernández, J.Z., S. Ossowski and A. Garcıa-Serrano, 2002. Multiagent architectures for intelligent traffic management systems. Transport. Res. C-Emer., 10(5): 473-506.

[17] Li, P., T. Zhang and B. Ma, 2004. Unscented Kalman filter for visual curve tracking. Image Vision Comput., 22(2): 157-164.

[18] Meijin, L., Z. Ying and H. Jiandeng, 2009. Video background extraction based on improved mode algorithm. Proceeding of 3rd International Conference on Genetic and Evolutionary Computing (WGEC'09), pp: 331-334.

[19] Sigal, L., S. Sclaroff and V. Athitsos, 2004. Skin colorbased video segmentation under time-varying illumination. IEEE T. Pattern Anal., 26(7): 862-877.

[20] Stauffer, C. and W.E.L. Grimson, 1999. Adaptive background mixture models for real-time tracking. Proceeding of IEEE Computer Society Conference on Computer Vision and Pattern Recognition.

[21] Yang, J., R. Stiefelhagen, U. Meier and A. Waibel, 1998. Visual tracking for multimodal human computer interaction. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '98), pp: 140-147.

[22] Ahmed Mahgoub Ahmed Talab, Zhangcan Huang, Moving Object Tracking based on Background Extraction Using Mean Algorithm and Three Temporal Difference Algorithm, Research Journal of Mathematics and Statistics 5(4): 43-47, 2013.

[23] Comaniciu D, Ramish V, Meer P. Real-time tracking of non-rigid objects using mean shift ,IEEE Conference Computer Vision and Pattern Recognition,2000:142-149.

[24] Barron J L,Fleet D J, Beauchemin S S. Performance of optical flow techniques. International Journal of Computer Vision, 1994, 12(1):43-77.

[25] Li P H, Zhang T W. Unscented Kalman filter for visual curve tracking. Image and Vision Computing, 2004,22(2):157-164.

[26] C.Stauffer, W.E.L Grimson. "Adaptive Background Mixture Models for Real-Time Tracking," in Proc. Computer Vision and Pattern Recognition Conf.,vol. 2, Fort Collins, CO, USA, June 1999,pp.246-252.

[27] SohailNadimi and BirBhanu "Physical Models for Moving Shadow and object detection in video",IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.26,Aug 2004,pp 1079-1087.

[28] Tao Zhao and Ram Nevatia, "Tracking Multiple Humans in Complex Situations", IEEE Transaction on Pattern Analysis and Machine Intelligence, vol. 26,Sep 2004,pp 1208-1221.

[29] Ahmed Elgammal, RamaniDuraiswami , David. Harwood, and Larry Davis, "Background and foreground modeling using nonparametric kernel density estmation for visual suveillance." IEEE Transactions on Pattern Abalysis and Machine Intelligence,vol. 90, July 2002 ,pp 1151-1163.

[30] Rita Cucchiara, Massimo Piccardi, Andrea Prati, "Detection Moving object, Ghoust, and Shadows in Video Streams", IEEE Transactions on Pattern Abalysis and Machine Intelligence,vol. 25, Oct 2003 ,pp 1337-1342.

[31] Wenmiao Lu and Yap-Peng Tan,"AColor Histogram Based People Tracking System",IEEE International Symposium on Circuits and System, vol.2, May 2001, pp137-140.

[32] Leonid Sigal , Stan Sclaroff and VassilisAthitsos , "Skin Color-Based Video Segmentation under Time-Varying Illumination", IEEE Transaction on Pattern Analysis and Machine Intelligence, vol. 25 July2004,pp 862-877.

[33] Ssu-Wei Chen, Luke K. Wang, Jen-Hong Lan, Moving Object tracking Based on Background Subtraction Combined Temporal Difference, International Conference on Emerging Trends in Computer and Image Processing (ICETCIP'2011) Bangkok Dec., 2011