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Video Background Extraction:A Survey

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Abstract— This paper reviews the studies involved in background subtraction techniques.Object detection is basically the most important step in video analysis. There are various studies which are aimed at detecting the objects in video sequences. But due to fast illumination change in a visual surveillance system, many of them are not tolerant to dynamic background. There are various background subtraction algorithms for detection of moving objects, but many of them fail with slow-moving objects or in poor image qualities of videos and does not distinguish shadows from moving objects. Among all the background extraction techniques, Multibackground model and Robust thresholding are the most efficient which can deal with the problem such as occurrence of shadow in its foreground.

Keywords— Background subtraction, Object detection, Thresholding, Multibackground model, visual surveillance system, moving objects, Illumination change.

INTRODUCTION

Identification of dynamic behavior of objects from a video sequence is a critical and fundamental task in video surveillance. It plays a significant role in human tracking and detection traffic analysis and monitoring and recognition of gestures in human-machine interface. Background subtraction is a basic term for the processes which aim to segment dynamic foreground objects from a static background. There is a crucial distinction between the background detection stages and background modeling, which constitute the complete subtraction process. The two stages of background subtraction are *overlapping* and *co-relating*.The modeling stage maintains and creates a model of the scene in the background. The detection process segments the current image into dynamic(foreground) and static (background) regions based on its background model.The resulting detection masks are then put back into the modeling process so as to avoid coincidence of foreground objects and background model.Developing an appropriate algorithm for background subtraction is a challenging task. It should be robust with respect to changes in illumination.Second, it must ignore the detection of dynamic background objects such as rain,snow, moving flowers and shadows casted by dynamic objects. Its internal background model must give a quick reaction to changes occurring in the background like starting and stopping of an object. The huge flow of traffic poses challenge to a background subtraction algorithm. The vehicles move at an accurate speed when the signal is green, but stop when signal turns red. The vehicle then remains static until the signal turns green. An appropriate background subtraction algorithm should deal with the dynamic objects that first merge into background and then become foreground after certain time. In addition, to meet the real-time requirements of various applications, a background subtraction algorithm should not be expensive and possess lesser memory requirements, while still be able to identify dynamic objects in the video accurately.In order to deal with these challenges, various background models and measures bound up to different optimization strategies have been developed in the past years. These techniques are more robust to instability in the background than other background subtraction techniques. In this paper, we have compared few most implemented background subtraction techniques on video sequences representing different challenges .The aim of this study is to find how better sophisticated techniques are compared to simple background subtraction techniques. To compare the processing power and the amount of memory required by each technique at run time.

PREVIOUS WORK

[1]In 2010, Parisa Darvish Zadeh Varcheie Michael Sills-Lavoie and Guillaume-Alexandre Bilodeau proposed an important background subtraction technique. The background is identified by rectangular areas shown by the color histogram and a text measure.

It is modeled at various scales to examine motion more accurately. This background model and Gaussian Mixture model are combined. The presence of rectangular regions filters out small motions such as data acquisition noise and swaying vegetation. The Gaussian Mixture background subtraction method then executes the work by defining foreground detection in rectangular areas where motion is detected. In Comparison to the Gaussian Mixture method, RECTGAUSS-Tex gives lesser false positive detection for same kind of true and positive results. The algorithm was implemented with various videos against multiple illumination resolutions and changes. The obtained results show that RECTGAUSS-Tex outperforms Gaussian Mixture method as it has same TPR, but lesser FPR. For the used data sets, it outperforms Code-book, TBMOD and KDE using their default parameters. Although the algorithm used eight such parameters, six among them are stable, only two required tuning. This motion detection algorithm can be implemented at various scales to adjust the object shape precision which is needed for an application that means Detection can be performed at coarse scale with large rectangles and without applying Gaussian Mixture method.

[2]In 2012, Vinayak G Ukinkar, Makrand Samvatsar published their work.They proposed an approach for detection of object in moving background. This approach is suitable for object detection in outdoor and indoor environment and is robust for fast illumination changes in the video sequences. It avoids detecting dynamic background objects such as rain, moving leaves, snow, and shadows of moving objects. And its background model reacts faster to change in background such as start and stopping of objects.

[3]In 2012,Y. Benezeth1 P.-M. Jodoin,B. Emile,H.Laurent,C..Rosenberger presented a comparative study of background subtraction algorithms. The study of several background subtraction methods is presented. The approaches range from general background subtraction with global thresholding to more critical statistical techniques and have been executed and tested on various videos. The aim of this study is to lay down a solid analytic basis to identify the advantages and drawbacks of the widely implemented object detection techniques. The techniques are compared on the basis of their robustness to various types of video, memory used by them, and the computation overhead they need. The effect of the Markovian prior and some of the post processing operators are examined. The videos used in the study come from benchmark databases and possess different challenges like camera bitter and poor signal-to-noise ratio.

[4]In 2013 Kalyan Kumar Hati, Pankaj Kumar Sa, and Banshidhar Majhi, stated an intensity range based object detection method for videos with static background and stationary cameras. The method uses two different algorithms.They model background from initial few frames and separate the object using local thresholding. The efficiency of these techniques is described by comparative study of competitive methods. Both quantitative measures as well as videos show better performance and the techniques have a strong ability for real time applications.

[5] Farah Yasmin Abdul Rahman, Aini Hussain, WanMimi DiyanaWan Zaki,Halimah Badioze Zaman, and Tahir cited improvement in Background Subtraction Techniques. They presented a hybrid technique that uses SDGD filters having four basic BGS methods, namely RA, RGA, FD and AM. This method improves segmentation performance, as shown by *F*-score values .This technique was implemented on different videos from various databases, and each video was captured indoors and outdoors and showed various scenes. An ANN classifier is used to distinguish non human and human images. This work emphasizes on BGS techniques, such as Gaussian average, approximate median and running average. In this study, they have removed the limitation by identifying all edge pixels.

[6] In 2013, Harsha Varian Helena Choithwani Tina Gyanchandani Dashrath Mane Kajal Sahatiya Shruti Gangan proposed a paper , they introduced many Background subtraction and modeling techniques with a problem which has inclusion of Shadow as Object in the foreground.The process of removing shadow by using invariance against illumination changes and improvements in obtaining the foreground data in comparison to previous background subtraction techniques have been discussed. Processing overhead is higher in this method. Alternative frames are considered to reduce time. The technique of classification of pixels possesses the same problem of excess computation.

[7] A review has been carried out by Hemavathy R, Dr. Shobha G to know the advantages and drawbacks of the techniques used in tracking and detection of the objects in both static and dynamic environments. A study is carried out to identify the problems faced in static and dynamic environment. Many algorithms are there to track the dynamic object in stationary and dynamic environments.Static technique does not pose any difficulty as compared to the dynamic techniques. In stationary environment condition is that the background will be static in the video and the fore ground is dynamic in the whole video.The foreground cane of single object or multiple objects and these objects can be tracked and detected from the first frame. Videos having natural scenes comprised of several moving objects. Objects of interest often move along complicated backgrounds that are themselves moving in dynamic

conditions.Many issues have been taken into consideration prior to the object is decided as moving entities in dynamic background. An observation is tube carried out on the video frames to check whether an object is moving or not.

[8] In 2014, A technique to detect dynamic objects in video by using a textual representation been cited in a paper by PRANAM JANNEYAND GLENN GEERS. Experimental results have verified that the methodology is effective to noise, low frame rate, illumination changes, and other camera-associated noise.The proposed algorithms approach improves the performance of other algorithms that are frequently used. Traffic videos taken in night time are still a challenging task which is still to be implemented using this proposed methodology. They have also stated a framework to estimate traffic density by using a foreground object detection-based method. They have successfully developed a process, such as showcasing its use for video analysis applications such as traffic density estimation

CONCLUSION

Much work has been carried out towards obtaining the best background model which works in real time. Most efficient of these algorithms would be to use a static frame without any foreground object as a base background model and use a simple threshold based frame subtraction to obtain the foreground. This is not suited for real life situations where normally there is a lot of movement through cluttered areas, objects overlapping in the visual field, shadows, lighting changes, and effects of moving elements in the scene (e.g. swaying trees), slow moving objects, and objects being introduced or removed from the scene. When dealing with a video for background subtraction then frames have to be stored in buffer and that requires a large buffer size and increase memory requirements.When a video or picture is shooting from the camera then various noises,illumination variation, shadow etc poses threat to background subtraction.

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