International Journal of Engineering Research and Science & Technology

ISSN : 2319-5991
Vol. 1, No. 1
March 2015

National Conference on "Recent Prends in Communication & Information Technologies"NCRTCIT 2015

Organized by

Dept. of ECE, Indra Ganesan College of Engg., Trichy, Tamil Nadu, India.

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Int. J. Engg. Res. & Sci. & Tech. 2015

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Special Issue, Vol. 1, No. 1, March 2015
National Conference on "Recent Prends in Communication & Information Technologies" NCRTCIT 2015

Research Paper

EFFECTIVE MOVING OBJECT DETECTION AND TRACKING

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Detecting and tracking moving objects in a video sequence is a fundamental and critical task in many video surveillance applications. The main objective of this paper is to develop an algorithm that can detect moving objects using background subtraction. Moving object detection techniques must be able to identify the moving objects which includes shadows and ghosts in any background. It should also detect objects with more similarity between foreground and background. This method of detecting and tracking moving objects using approximate median filter is well capable of dealing with the above mentioned limitations.

Keywords: Video Surveillance, Approximate median filter, Background Subtraction, Object detection

INTRODUCTION

Nowadays the real-time information is very important in the surveillance area such as in military reconnaissance, mobile robot navigation, path planning the motion detection is very important thing. So in proposed system the digital camera is used for tracking the video of the area. Basically there are three techniques which are used for the motion detection in the sequence of the images such as frame subtraction, optical flow and background subtraction algorithm.

Frame subtraction method is through the difference between two consecutive images to determine the presence of moving objects. Its calculation is simple and easy to implement. The Frame Subtraction is to appear the empty phenomenon; as a result generally difficult to obtain a complete outline of moving object, liable the detection of moving object is not accurate.

In optical flow method the optical flow generated in the sequential images taken by a moving camera is used for detecting the object motion in the images (Mamta Sood *et al*., 2013). The detection is executed with analysis of the flow distortion, so that the moving object is distinguished from the static objects. In this method, a large quantity of calculation, sensitivity to noise, poor anti-noise performance, makes it not suitable for real-time demanding occasions.

The idea of background subtraction is to subtract or difference the current image from a reference background model (Priti P Kuralkar and

[1] Saranathan College of Engineering, Department of Electronics and Communication Engineering.

Prof. V T Gaikwad, 2012). This algorithm will subtract the background from the frame to get the moving object in the frame. Out of these background subtraction algorithm is used.

This work mainly focuses on developing an algorithm for detection and tracking of moving objects in a video sequence. Video surveillance of human activity generally needs persons to be detected and background subtraction is a mighty mechanism for recognizing changes in the video sequence (Malikarjuna Rao G and Satyanarayana Ch., 2014). All the evaluation has been performed on a windows PC running MATLAB R2011a. MATLAB has an Image Processing Toolbox for handling images and videos efficiently. Algorithms can be extended for real time applications.

The implementation of this object tracking is explained step by step as follows.

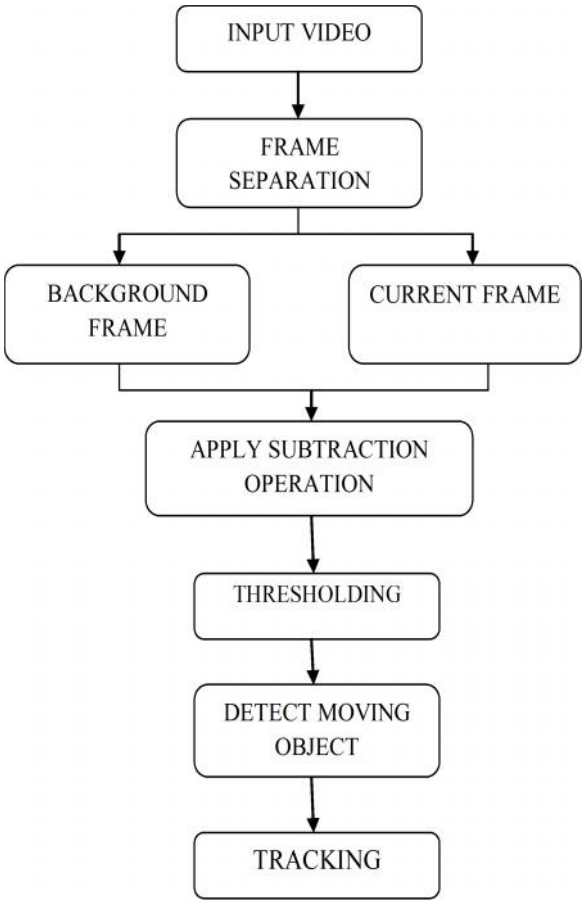
In section II, overview of the system is explained. In section III, implementation of moving object detection technique is explained. In section IV, algorithm that are developed to accomplish this work is explained. In section V, conclusion is made.

OVERVIEW OF THE SYSTEM

In proposed system the main aim is to build effective moving object detection algorithm that can detect and Track object in video.

1. The first step is to get an input video.
2. For processing the video files, convert video into frames and from frames to images.
3. Next step is to take the first frame as a Background frame and the next frame as current frame.
4. Apply subtraction operation between the background frame and current frame.
5. Then Threshold operation is performed and foreground object is detected.
6. The last step is to track object in video.

Figure 1: Overview of the System



MOVING OBJECT DETECTION

Pre-processing

The median filter is a classical noise removal filter. Noise is removed by calculating the median from all its box elements and stores the value to the central element. If we consider an example of 3x3 matrix,

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

The median filter sorts the elements in a given matrix and median value is assigned to the central pixel (Malikarjuna Rao G and Satyanarayana Ch., 2014). Sorted elements 1, 2, 3, 4, 5, 6, 7, 8, 9 and median 5 will assign to the central element. Similar box scan is performed over the whole image and reduces noise. It removes the small pixel noise.

Frame Difference

In Frame Difference, the frame difference between current frame and previous frame, which is stored in Frame Buffer, is calculated and thresholded. It can be presented as

$$FD(x, y, t) = | I(x, y, t) - I(x, y, t-1) |$$

$$FDM(x, y, t) = 1 \text{ if } FD \geq Th$$

$$0 \text{ if } FD < Th$$

where I is frame data, FD is frame difference, and FDM is Frame Difference Mask. Pixels belonging to FDM are moving pixels. Note that there is a parameter *Th* needed to be set in advance [11].

BACKGROUND SUBTRACTION

The background subtraction is the common method of detecting moving object. This model provides a statistical description of the entire background scene. This scene may be static or dynamic [10]. It is a technology that uses the difference of the current image and the background image to detect the motion region. The background image is subtracted from the current frame. If the pixel difference is greater than the set threshold value T, then it determines the pixels from the moving object, otherwise, it is considered as the background pixels [7]. Here we consider first frame as the background frame directly and then that frame is subtracted from current frame to detect moving object. The moving object can be detected after applying threshold operation. Its expression is given below

$$D_k(x, y) = \begin{cases} 1 & \left|F_k(x, y) - B(x, y)\right| \\ 0 & others \end{cases}$$

where $D_k(x, y)$ is the binary image of differential results, T is a fixed value for ideal conditions; its size determines the accuracy of object identification.

ALGORITHM

This section explains the algorithms used to detect moving objects in a video sequence.

1. Initially the first frame is considered as the background (BG).
2. Subtract the pixel intensity value of the current frame (FR) from the background image.

   Difference = abs (FR – BG)
3. Take median for the above difference and it is normalized.
4. If (Difference > Threshold)

   FG = 1

   Else

   FG = 0
5. Get the next input frame and go to step 2.

EXPERIMENTAL RESULTS

The experimental results are presented to show that the proposed methods can achieve promising performance in background subtraction and foreground object extraction. This system detects and tracks the moving objects exactly. In this approach, the background scene is modeled using a set of background image frames, which basically consists of 5-30

consecutive frames. The object pixels are segmented out from its background.

CONCLUSION

An effective moving object detection technique is presented in this paper. The system has been implemented based on Approximate Median Filter. The algorithm has experimentally been shown to be quite accurate and effective in detecting moving object even under bad lighting conditions or occlusions. Future work focuses on tracking system which can be used in applications where accurate tracking is required but good lighting conditions cannot be provided. The video tracking system is furthermore very much applicable to areas like video conferencing and surveillance. This can be further extended for the use in real-time applications.

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