Hybrid Approach for Moving Object Detection in Video Surveillance System

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***Abstract*— Object tracking detection plays a vital role in video surveillance system. It is mainly focused in banks, tele conferencing, shopping and traffic monitor system. Object tracking is the process of detecting objects which is moving in sequences frames of a video, to detect the moving objects, different techniques are used such as background subtraction, optical flow, GMM(Gaussian Mixture Model). The main objective of the proposed work is to detect the moving objects with less complexity and accuracy using frame differencing method. First background subtraction is detected using recursive technique. Then noises are removed by wiener filter and YCbCr Color space for foreground object. In order to obtain accurate detection, shape based image retrieval technique is used. Finally the experimental results show that this method can reduce complexity and generate accurate image without any noises.**

***Keywords*— Video surveillance, YCbCr, Background subtraction, Frame Differencing, Wiener Filter, Object detection.**

I. INTRODUCTION

In digital technology, video files are come into all area at present. It is integrated in many applications, capture through the TV or through the CDs for using as attachments as email items [1]. Detecting moving objects from background is a vital role in video surveillance applications such as bank, shopping, traffic monitor system, and teleconferencing. Object detection is a 1st step in video analysis. [2] List few applications and they are visual surveillance, content based video retrieval, precise analysis of athletic performance. Object detection is the first step in object tracking. Objects can be detected which are moving by several methods such as frame differencing, optical flow and Background Subtraction [3]. It is a common method for moving object segmentation in static images. In this method, initialize a background frame and find the difference between current frame and background frame pixel by pixel. If difference is greater than threshold, declared as foreground. After that, morphological operations are performed to enhance the quality [4]. In [5], Background subtraction has 2 types of approaches: 1) Recursive technique [5, 6] which doesn't need to uphold a buffer. Instead of, updating a single background model recursively depend on each input frame. It has various methods such as approximate median, adaptive background, Gaussian of mixture. 2) Non-Recursive technique which uses sliding-window approach to background image based on the temporal variation of each pixel within the buffer that stored the previous L video frames [6, 5]. Approximate median method is proposed by McFarlane and Schofield [7]. In this method, median is incremented by one if pixel in input frame is greater than background, else decremented by one. This has less memory and also doesn't need to uphold a buffer. In image processing, Image denoising which means removal of noise is an important task Wiener filter is a statistical approach which is filter out noise from a different angle. It can be characterized by assumption, requirement, minimum MSE [8]. The remaining part of the paperwork is arranged as follows: In Section 2, discuss some related works. In section 3, implementation of proposed algorithm is described. In section 4, experiments are carried out by using different video sequence and results are produced. In section 5, conclusion is given.

II. RELATED WORK

G. Mallikarjuna Rao *et al*. [9] have proposed algorithm for track the object using Approximate Median Filter, Kalman Filter and Dynamic Template Matching. In this system, tracking object from live or already stored one. By using of approximation median method, object can be detected which is moving with high accuracy and effective even if occlusions and bad lighting conditions are happened. An experimental result shows that the proposed algorithm gives robust performance.

Kumar *et al*. [10] presents comparative study of different colorspaces for detect foreground and their shadows. In this study, they consider 5 type of color spaces "RGB", "XYZ", "YCrCb", "HSV", and the normalized "rgb" and represent which color space is suit for the both moving object and shadow detection by comparing them based on true and false detection and detection of moving object. A results conclude that YCrCb is best color space for object detection and robust to light.

Adesh Hardas *et al*. [11] has applied background subtraction model for object detection which is moving and analyzing the performance of the proposed scheme in different color spaces namely "HSV", "RGB", "YCbCr". From that analysis, all color space are not apt to all shadows. Thus, HSV and RGB are fit to outdoor shadow / dark and YCbCr is best for indoor shadow / light.

The Proposed System use approximated median filter by Swantje Johnsen *et al*. [12] for background modeling. For the implementation , better results were obtained by scaling

the increment and decrement by a step factor if the absolute difference between the current pixel and the median-modeled background pixel is bigger than a threshold.

A comparative study is presented by Himani S. Parekh *et al*. [3] for Objects Detection and Tracking based on accuracy and computation time. In this survey, approximate median method computation time is low to moderate and accuracy is moderate.

III. Proposed Method

A. Overview of the proposed system

The objective of the proposed method is to construct an effective and efficient object detection algorithm to detect the object which is moving in a given video and label it. In this method, video clip is given as input is partitioned into different frames at defined rate. Second, these frames which are already RGB color space converted in to YCbCr color space which are already make simple in concept wise. Third, frames are come with noise and using Wiener filter this noise is removed to give best results for further process. Fourth, Frame Differencing method is applied on these frames and set threshold value. After that, moving object in background frame is detected and performs morphological operation is performed to remove the shadow, smoothing boundaries, unnecessary details in image. Then, detected object is labelled by shape based image retrieval technique. The flow chart for the proposed algorithm is given as in figure 1.

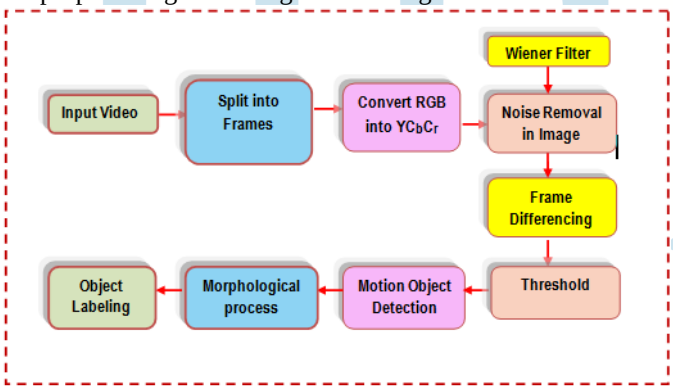


Fig.1 Flow chart for the proposed Algorithm

B. Input Video

The first step is to capture video clip through CCTV/ Camera and take as an input. In this system, AVI Video is taken due to capability for storing the audio and the video file.

C. Split into Frames

Video has collection of images in a sequence. Video can't be processed directly so it is partitioned into different frames to reduce the computation complexity. In dynamic field, object detection is the process of detecting the moving foreground object in a background frame and it will change frame by frame. So before processing, video is partitioned into frames at defined rate.

D. Convert RGB in YCbCr Color space

After the frames are extracted from video, the conversion is take place to YCbCr intensity images. Frames are having RGB color space so they are converted in to YCbCr which make simple in concept wise. YCbCr color space has 1-luminance(Y) and 2-Chrominance components (Cb and Cr). The property of YCbCr is that Human eye is more sensitive to light changes compared to color changes. YCbCr color space is found to be more robust to illumination change and thus, this color space is suit to light / indoor shadow.

E. Noise Removal

In image processing, Image denoising which means removal of noise is an important task because if image has noise then it is possible to degrade the quality of the image. The term "Video denoising" defines the noise in a video frames can be removed/reduced by filter method. In proposed system, this pre-processing step is done by Wiener filter. Wiener filter is a statistical approach which is filter out noise from a different angle. It can be characterized by assumption, requirement, minimum MSE.

F. Frame Differencing

Frame differencing is the simplest method in Background subtraction. A background image without any moving objects of interest is taken as the reference image. Pixel value for each co-ordinate (x,y) for each color channel of the background image is subtracted from the corresponding pixel value of the input image. If the resulting value is greater than a particular threshold value, then that is a foreground pixel otherwise background [13].

If $|\ frame\ i - background\ i| > threshold$ is true, then the pixel i is foreground.

This method does have two major advantages. One obvious advantage is the modest computational load. Another is that the background model is highly adaptive. Since the background is based solely on the previous frame, it can adapt to changes in the background faster than any other method. A challenge with this method is determining the threshold value.

G. Threshold

It is one of the techniques for the image to be segmented so that moving objects are separated from background frame. Suitable threshold value (T) is applied to obtained binary image which is converted from complex image. If difference value is greater than threshold then it is represent as 1, else represent as 0. In image processing, 0 indicates black and 1 indicates white. Therefore, detected moving object which is in white and the background is black by use of threshold value.

H. Morphological Process

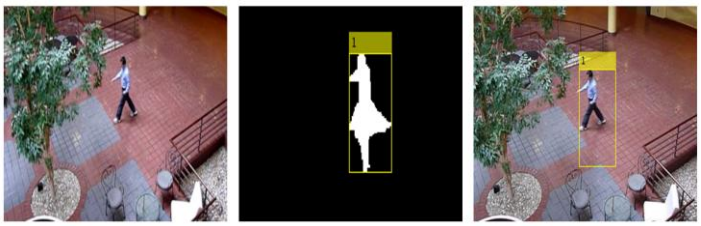
After segmentation, morphological operation is applied on segmented frame because of it fill up the empty holes, smoothing and extracting edges. This is the post process technique which is helps to reduce noisy pixels. Morphological has two operations which one is dilation (adding pixels to the object boundaries) and erosion (subtracting pixels from the object boundaries). Thus, determine the correct segment image.

I. Object Labeling

The final step of the proposed system is label the detected moving object. Moving object is labeled through shape based image retrieval technique. Among color, texture feature, shape is a best visual and primitive feature. In this system, object is labeled by rectangle box.

IV. Result and Discussions

Our proposed hybrid moving object detection has been legalizing by testing with variety of videos. The proposed method has been implemented in Matlab We employ frame differencing technique with threshold value followed by morphological operations to detect the moving object. In fig 1 (a) represents the input video,(b) represents the foreground detection and finally (c) represents detecting the objects using the proposed method.



(a) Input Frame (b) Foreground Detection (c) Object Detection

Fig.2 Segmentation Results

The experimental results fig 1 shows that the proposed hybrid method is capable to detect every moving object incidence of disorder in background and illumination adjustment in outdoor as well as indoor location. These results, provides that the shadows of objects are also detected as a division of moving objects.

V. Conclusion

In this paper, real-time, accurate and an efficient method for detecting foreground object is presented. The proposed system is implemented by using Frame Differencing with threshold value followed by morphological operations. This algorithm is fast and also has capability to detecting object better. YCbCr color space is found to be more robust to illumination change and thus, this color space is suit to light / indoor shadow. An experiment is conducted on video and obtained good results. Further research will concentrate on improving the algorithm by defining criteria for identifying what properties characterize objects and distinguish them from other objects and from the background that will allow us to find the disappeared object.

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