An approach for Object Detection and Object Tracking using Background Subtraction

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ABSTRACT

Usually, the video based object tracking deal with non-stationary image stream that change over time. Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications. Robust and real-time moving object tracking is a problematic issue in computer vision research area. In the existing system researchers have designed a modified PN learning algorithm for enhancing the performance of system. Modified PN learning algorithm achieves performance to increase the frame processing by adding background subtraction technique for any real-time object detection to track single object in video stream. Special feature used in this technique is Region of Interest (ROI) which minimizes the searching region. Existing system works poor for multiple moving object detection. The proposed system is designed for multiple moving objects tracking in real-time. In proposed system we use background image update, color segmentation and edge detection technique. We use border detection method for better object detection. There are problem in tracking real-time multiple object through a sequence of video. Thus, we solve this problem using Particle filter techniques that has been proven to be a robust algorithm to any real-time moving object.

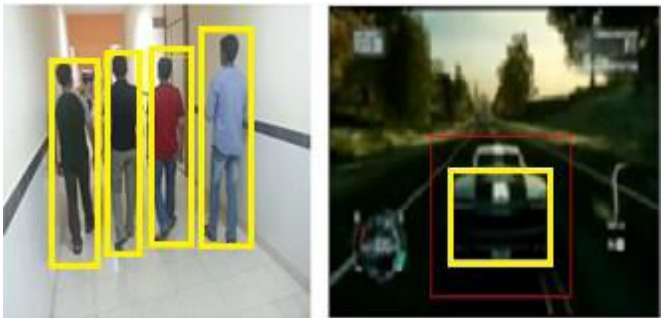
Keywords: - *Object detection, object tracking, background subtraction, background image update, canny edge detector*

I. INTRODUCTION

Object detection is to identify objects of interest in the video sequence and to cluster pixels of these objects. Object detection involves identifying whether a known object is in a scene and, if so, determining the location of the object [5]. Object detection means find the location of object if it is in an image. It is method to tracked object frame by frame.

Tracking can be defined as the problem of approximating the path of an object in the image plane as it moves around a scene. The purpose of an object tracking is to generate the route for an object above time by finding its position in every single frame of the video. Object is tracked for object extraction, object recognition, detection and tracking, and decisions about activities [3]. Object to be tracked depends on application. People may be targeted in various area such as buildings, corporate offices, airports, railway stations, market places, public places for surveillance as shown in figure 1(a) left. Target may be a moving car in an application like gaming shown in figure 1(b) right [1].

Target object may have similar shape and color as that of the other undesirable object when the video is under rapid motion. It may happen that the target object and background objects may be similar in terms of appearance. This may interfere in the observation [1].



(a) (b)

Figure 1 Examples of targets for video tracking: (a) people, (b) moving car [1]

II. PROPOSED MODEL

From the Literature review it is concluded that many algorithms that are already work for increase the accuracy of object detection and object tracking. Proposed algorithm is based on multiple moving object and constant running object in environment. PN learning & PCA are methods by adding background subtraction technique for automatic tracking & learning of any real-time object, but existing system performs poorly for multiple object tracking, learning & detecting in term of computing time required. The purpose of proposed algorithm is to improve the performance and accuracy using feature extraction method in multiple moving objects. The proposed system is too designed for multiple moving object tracking in real-time. In proposed system we use background image update, color segmentation and edge detection technique. There are problem in tracking real-time multiple object through a sequence of video. Thus, we solve this problem using Particle filter technique that has been proven to be a robust algorithm to any real-time moving object.

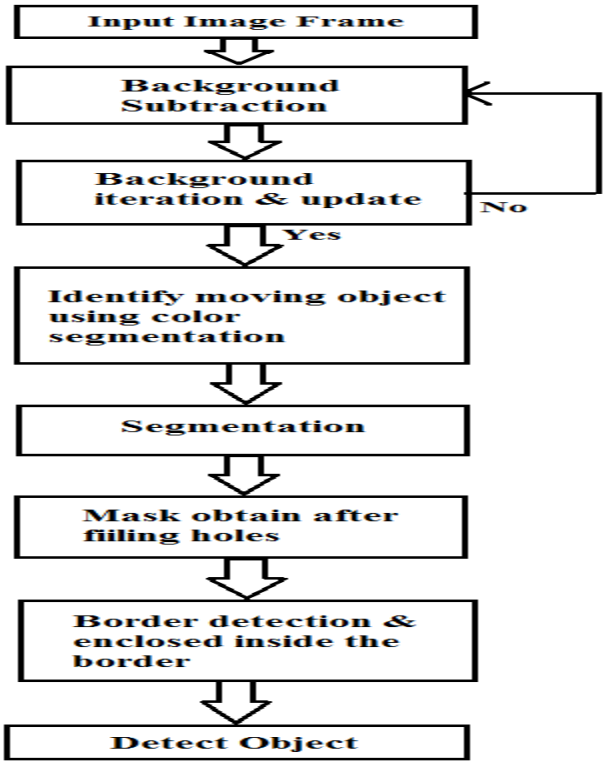


Figure 5 Logical architecture of Proposed System

Following are the steps of proposed system:

Step 1: First take an image frame as an input image.

Step 2: Apply Background subtraction method for detection of object.

Step 3: Take a detected object as a background image.
Step 4: Identify moving object using different color segmentation such as, (RGB, Gray scale, binary).
Step 5: Use different filter method (like Particle & notch filter) to improve the accuracy of multiple object.
Step 6: filling the holes after detecting the current image of moving object.
Step 7: use canny edge detector for border detection to get better result of target object.
Step 8: Get output image.

III. BACKGROUND SUBTRACTION

Background subtraction technique is used for motion segmentation in static scenes [13]. It detects moving regions by subtracting the current image pixel-by-pixel from a reference background image that is created by averaging image over time in an initialization period. The pixel where the difference is above a threshold is classified as foreground. After creating a foreground pixel map, some morphological post processing operation such as erosion, dilation and closing are performed to reduces the effects of noise and enhance the detected regions. The reference background is updated with new images over time to adapt to dynamic scene changes. Background subtraction scheme gives the most promising results in terms of detection quality and computational complexity to be used in a real-time surveillance system [14], [15], [16].

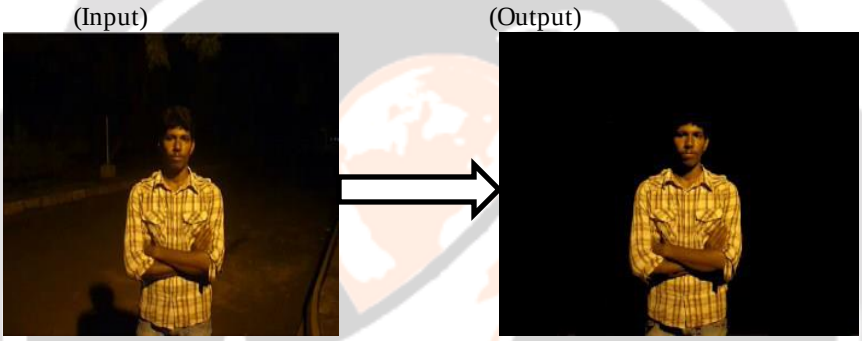


Figure 2 Background Subtraction outputs [4]

IV. BACKGROUND IMAGE UPDATE

In other to ensure accurate object detection in unconstrained environment, we use a method of background image update. This method uses a detected objects area of current frame and old background image to create a new background image in every frame. New background image is obtained by copy detected objects area of old background image into detected objected area of current frame. Figure 5 shows the process of a background image update.

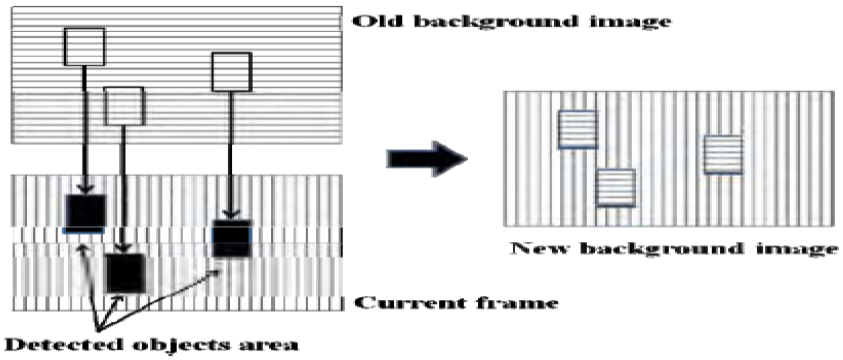


Figure 4 Process of background image update [2]

V. CANNY EDGE DETECTOR

The canny edge detector is used to identify the edges of the object and their traces to detect the object. It is the most common and frequent method used for the object detection for its curve let transforms property. The canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. It determines the edges of the object more accurately than other operators. Because of the canny edge detector is susceptible to noise in raw unprocessed image data, it uses a filter based on a Gaussian, where the image is convolved with a Gaussian filter. The result will be a blurred version of the original which is not affected by a single noisy pixel to any significant degree. An edge in an image may point in various directions, so the canny edge algorithm uses four filters to detect vertical, horizontal, and diagonal edges in the image. The edge detection operators (Roberts, Prewitt, and Sobel) return a value for the first derivative in the horizontal direction (Gx) and the vertical direction (Gy). From this the edge gradient and direction can be determined. While tracking an edge, we have to apply a lower threshold value, allowing us to track the image edges and the routes for the large gradient measures. Once this process is complete we have a binary image where each pixel is marked as either an edge pixel or a non-edge pixel. This process removes the background and detects the edges of the image is obtained as shown in Figure 3.

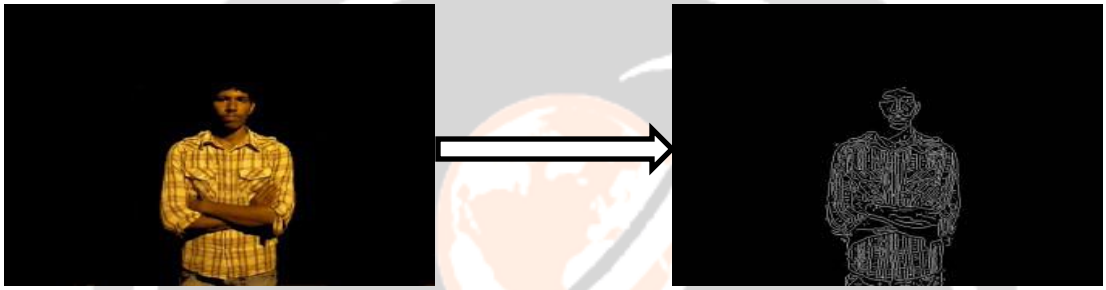
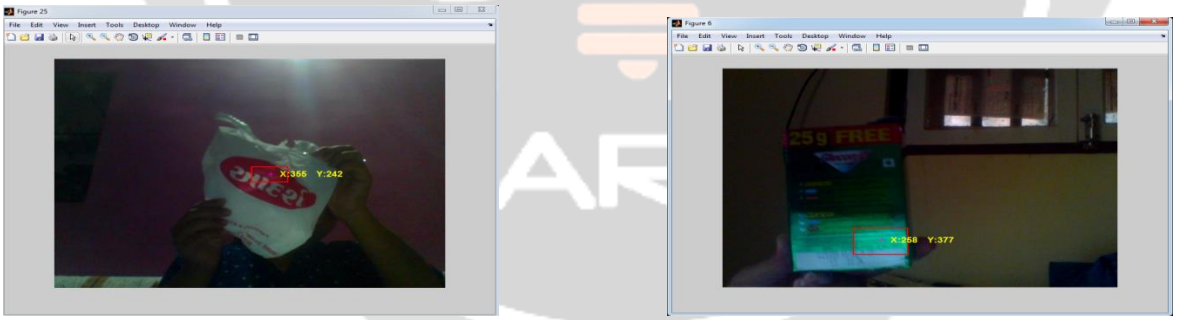
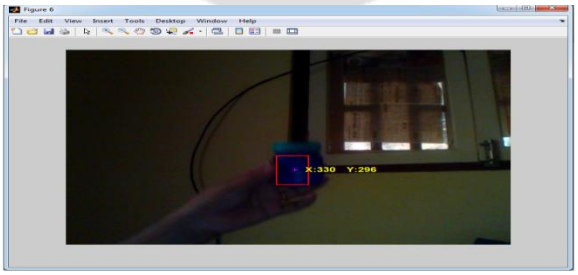


Figure 3 Edge Detection output [4]

VI. EXPERIMENTAL RESULT



(a) **(b)**



(c)

Figure 4 Real-time single object Detection (a) Red object (b) Green object (c) Blue object

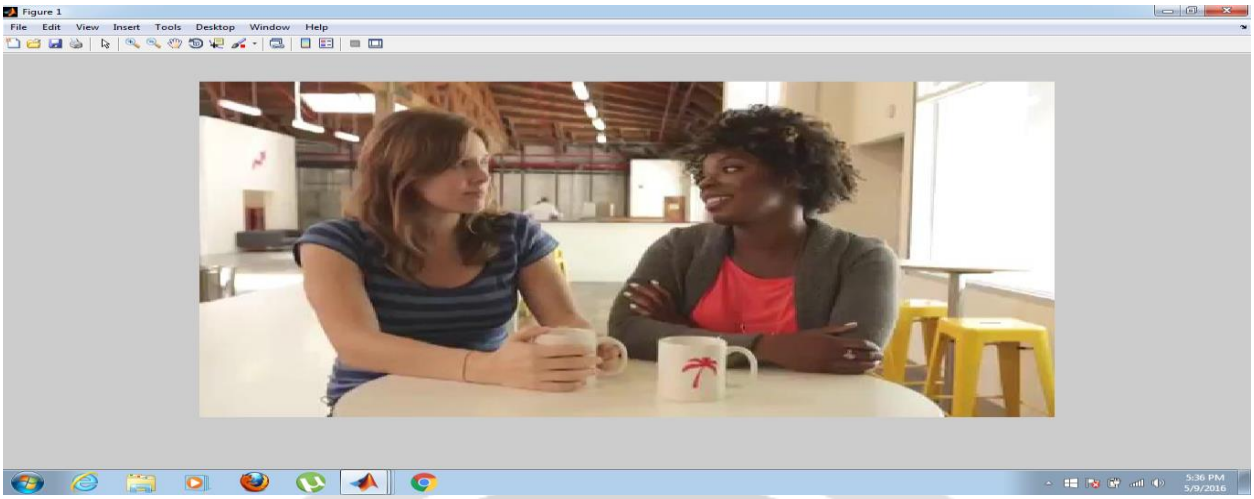


Figure 5 Input Image frame

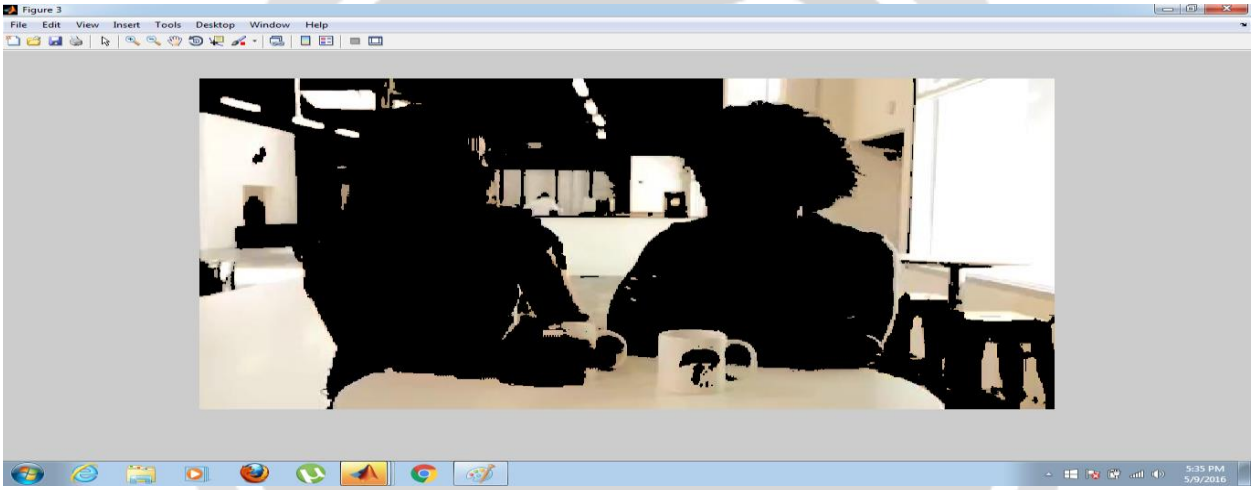


Figure 6 Background Subtraction Output

Figure 7 Canny Edge Detection Output

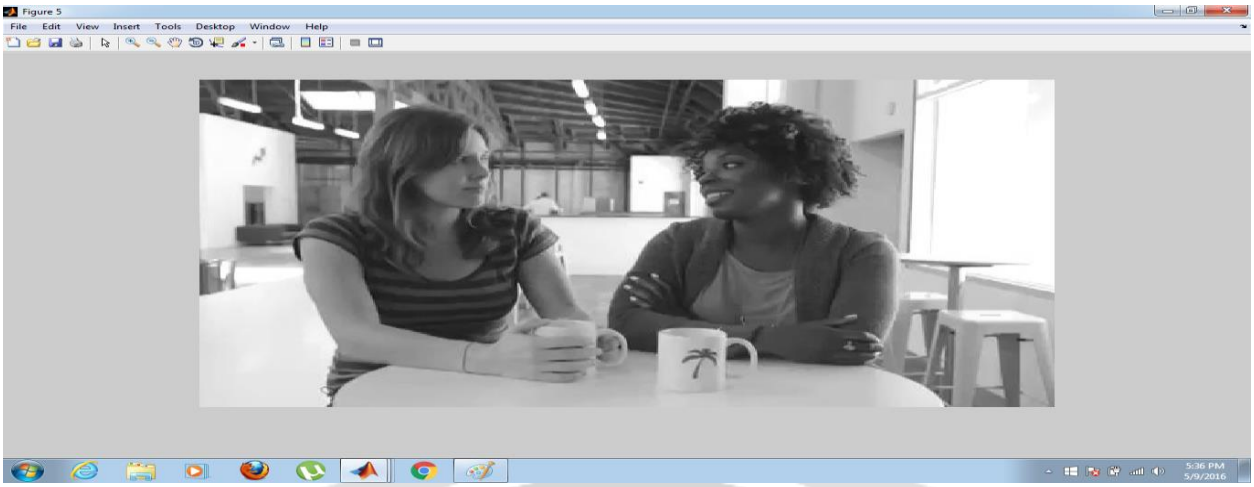


Figure 7 Detected Object Output

VII. CONCLUSION

The proposed system has been designed to track multiple objects using various video sequences. Proposed system solves the problem of the clutter in video steam. We used background subtraction algorithm for object detection. We use particle filter to overcome the clutter problem. Particle filter has been proven to be a robust algorithm to deal with the nonlinear, non-Gaussian problem. Proposed system successfully tracked multiple objects in a real-time video stream.

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