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VIDEO OBJECT TRACKING BASED ON HMM FEATURE RECOGNITION

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ABSTRACT
Object or target tracking alludes to the issue of utilizing sensor estimations to focus the location, path and characteristics of objects of interest. The video based object tracking manages non-stationary picture stream that progressions after some time. Vigorous and Real time moving object tracking is a hazardous issue in PC vision research area. The position, speed, and track of moving targets, for example, people and vehicles, which could be computed by their locations at whenever in pictures fundamentally, were needed for management. Tracking objects in video successions of reconnaissance camera is these days a demanding application. Tracking objects is a great deal additionally difficult in video sequences to enhance recognition and tracking exhibitions. There are numerous current strategies for object tracking yet all has a few disadvantages.
Keywords: *Object Tracking, Background Subtraction, Contour based Representation, Object Representation.*

I. INTRODUCTION

Object tracking is an essential employment inside of the field of PC vision. Object detection includes locating objects in frames of a video sequence [1]. Tracking is the procedure of locating moving objects or numerous objects over a stretch of time utilizing a camera. In fact, tracking is the issue of evaluating the direction or way of an object in the picture plane as it moves around a scene [2]. The high-powered PCs, the accessibility of high quality and inexpensive camcorders, and the expanding requirement for automated video examination has created a lot of enthusiasm for object tracking algorithms [3]. There are three key strides in video examination:

- Detection of intriguing moving objects.
- Tracking of such objects from frame to frame.
- Analysis of object tracks perceives their conduct.

Tracking is a critical and troublesome issue that stirs enthusiasm among PC vision researchers. The goal of tracking is to set up correspondence of objects and object parts between successive frames of video [4, 5]. It is a huge errand in the greater part of the reconnaissance applications since it gives cohesive temporal information about moving objects which are utilized both to upgrade lower level processing, for example, motion segmentation and to empower larger amount information extraction, for example, activity examination and conduct acknowledgment. Tracking has been a troublesome errand to apply in congested circumstances because of incorrect segmentation of objects [6]. Normal issues of erroneous segmentation are long shadows, incomplete and full impediment of objects with one another and with stationary things in the scene. Therefore, managing shadows at motion detection level and adapting to impediments both at segmentation level and at tracking level is critical for robust tracking. Tracking in video can be arranged by necessities of the applications it is utilized as a part of or as per the strategies utilized for its answer. Entire body tracking is by and large satisfactory for outdoor video surveillance while object's part tracking is vital for some indoor reconnaissance and

larger amount conduct understanding applications [7].

There are two regular methodologies in tracking objects as a whole one is in light of correspondence coordinating and other one does explicit tracking by making utilization of position prediction or movement estimation [8]. Then again, the techniques that track parts of objects utilize model-based plans to find and track body parts. At last find object attributes and its features that could be utilized as a part of different application and real time situation. Object identification systems have been delegated point detectors, segmentation and background subtraction [9].

II. FEATURE SELECTION FOR TRACKING

It assumes an essential part to choose a legitimate feature in tracking. So feature selection is firmly identified with the object representation [10]. Case in point, shading is utilized as a feature for histogram based appearance representations, while for contour-based representation, object edges is normally utilized as features. For the most part, numerous tracking algorithms utilize a blend of these elements. The points of interest of basic visual components are as per the following:

- Color-Color of an object is influenced by two variables. They are Spectral power dispersion of the illuminant and Surface reflectance properties of the object. Diverse shading models are RGB, L*u*v and L*a*b used to represent color.
- Edges- boundary-Edge detection is utilized to distinguish strong changes in picture intensities produced by object limit. Edges are less sensitive to illumination changes contrasted with shading elements [11]. Most prevalent edge identification methodology is Canny Edge detector.
- Optical Flow- It is a dense field of displacement vector which characterizes the interpretation of every pixel in an area. It is processed utilizing the brightness constraint, which expect brightness steadiness of comparing pixels in consecutive frames. Optical Flow is usually utilized as a feature as a part of motion based segmentation and tracking application.
- Texture-Texture is a measure of the power variety of a surface which evaluates properties, for example, smoothness and consistency. It obliges a handling stride to produce the descriptors. There are different composition descriptors: Gray-Level Co-occurrence Matrices, loss texture measures, wavelets, and steerable pyramids.

For the most part elements are picked manually by the user relying upon the application. The issue of automatic feature selection has gotten huge consideration in the pattern recognition community. Automatic feature selection techniques can be separated into, Filter Methods and Wrapper Methods. Channel systems attempt to choose the components in light of general criteria, while Wrapper techniques chooses the features taking into account the value of the features in a specific problem domain.

III. COMPLEXITIES OF TRACKING

Tracker appoints reliable marks to the tracked objects in distinctive frames of a video. Furthermore, contingent upon the tracking domain, a tracker can likewise give object-driven data, for example, orientation, area or shape of an object. Tracking objects can be perplexing because of:

- Loss of data due to projection of the 3D world on a 2D image.
- Complex object motion and noise in images.
- Non rigid or articulated nature of objects, partial and full object occlusions.
- Complex object shapes.

- Scene illumination changes, and
- Real-time processing requirements.

By forcing imperatives on the movement and appearance, objects can be tracked. All tracking algorithms expect that the object motion is smooth with no unexpected changes. One can compel the object motion to be of steady speed or a consistent acceleration in view of former data. Colossal information about the number and the measure of objects, or the object appearance and shape, can likewise be utilized to streamline the issue. Various methodologies for object tracking have been proposed.

IV. OBJECTIVES

- The purpose of the tracking part is to detect moving objects from the video stream and collect appropriate data of their routes.
- Tracking is usually performed in the context of higher-level applications that require the location and/or shape of the object in every frame.
- At each frame a set of trajectories and a set of measured objects are available. Each object is identified by finding the matching trajectory.
- The motion tracking task was decomposed into two independent sub problems.
- The task is to detect foreground objects on a frame-wise basis, by labelling each pixel in an image frame as either foreground or background.
- After tracking show a video with the tracked object segmented and tracked path

V. HMM METHODOLOGY

Given a finite sample space *S* and an event *A* in *S*. We define $P(A)$ is the probability of *A*, then.

$0 \le P(A) \le 1$ for each event *A* in *S*.

$P(S) = 1$.

$P(A+B) = P(A) + P(B)$ if A and B are mutually exclusive events in *S*.

Joint probability: If *A* and *B* are random variables, then the joint probability function is $P(a,b) = P(A = a, B = b)$

Conditional probability: the probability of A conditioned on B is defined as $P(A|B) = \frac{P(A,B)}{P(B)}$

Product rule: from the definition of conditional probability, the product rule is $P(A,B) = P(A|B)P(B) = P(B|A)P(A)$

Chain rule : the chain rule is an extension of the product rule which we can write down in more generic form as:

$$P(a_1, a_2, \ldots, a_n) = P(a_1 | a_2, \ldots, a_n) P(a_2 | a_3, \ldots, a_n) \ldots\ldots P(a_{n-1} | a_n) P(a_n)$$

Bayes' rule: Bayes' rule is an alternative method to calculate the conditional probability if the joint probability $P(A,B)$ is unknown. From the conditional probability, we know $P(A|B)P(B) = P(A,B)$ as well as $P(B|A)P(A) = P(A,B)$.

Bayes rule is $P(A|B) = \frac{P(B|A)P(A)}{P(B)}$

Entropy: Entropy is the measurement randomness of a system. If *S* is a finite set of values based on a probability distribution, the Entropy $H(S) = \sum_{i=1}^{n} -P(s_i) \log P(s_i)$ where *S* takes the value s_i , $1 <= i <= n$.

VI. METHODOLOGY/PLANNING OF WORK

- Load the video and divide it into frames.
- Perform image pre-processing and frames adjustment.
- Deduce the data using background subtraction
- Multi order markov modelling of the deduced objects
- Track the position of the object
- Gaussian prediction for assessment of object position in the consecutive
- Continue the process till end of video
- Perform Object detection and position analysis.
- Create Data set for visualization of tracked path
- Use blur or defocus filter to test accuracy of the results.

VII. RESULTS

Figure 1 shows the output of tracking system under multiple objects

Figure 2 shows the output of tracking system under multiple objects with tracked path

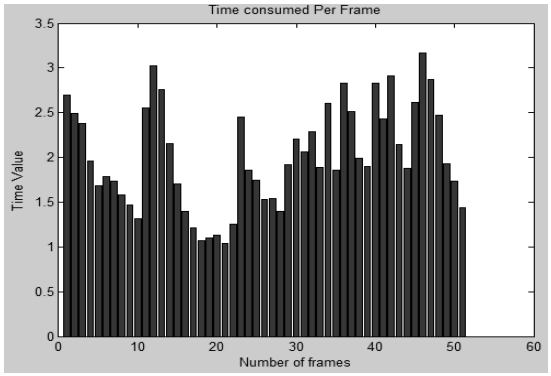

Figure 3 shows the time required for processing teach frame

VIII. CONCLUSION

In the proposed system object detection and tracking is done using the HHM modeling by formulating the video frame data into a probability variable and then searches for the occurrence of similar probability variables in the consecutive frame, this occurrence is verified by bayes prediction and matching, the proposed works for multi objective function and can track details with a processing time of less than 2 seconds per frame

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