International Journal of Information Movement Vol.2 Issue IX (January 2018

Website: www.ijim.in ISSN: 2456-0553 (online) Pages20-26

TRACKING MULTI-OBJECT USING FILTERING, MEAN SHIFTAND PROBABILITY DISTRIBUTION

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Abstract - The object tracking is the technique in which location of the object is tracked on the basis of probability distribution. In the technique of probability distribution location of the object is estimated on the basis of their location distribution. In the existing work, probability distribution is calculated of the single object is tracked. In the proposed work, enhancement is proposed in probability distribution algorithm in which multiple objects are tracked. In the proposed technique the morphological segmentation is applied which will scan the whole object and identify number of objects in each framer. To remove noise from the frames bilateral filter is applied. The technique of probability distribution is applied to prediction location of the object in next frame. To gather location of multiple objects technique of mean shift is applied which will gather information of multiple pixels. The simulation is performed in MATLAB and it is been analyzed that proposed algorithm performs well than existing algorithms.

Keywords: Moving object Detection, Tracking,

1.0 Introduction

The goal of object tracking is to find the trajectory of an object or multiple objects from a sequence of images. The results of object tracking i.e. trajectory of an object can be either of interest in its own right or can be used as the foundation for higher level analysis. [1] The input to the object tracking method is a sequence of image frames taken after small intervals of time from the changing world.Object Detection is the task of identify objects of interest in a video sequence and to cluster pixels of these objects. Since moving objects are typically the primary source of information, most methods focus on the detection of such objects. [2] The extracted moving region may be different objects such as Humans, vehicles, birds, floating clouds, swaying tree and other moving objects.Tracking can be defined as the problem of approximating the path of an object in the image plane as it moves around a scene. [3] The purpose of an object tracking is to generate the route for an object by finding its position in every single frame of the video. Image segmentation can be defined as the mechanism of subdividing a digital image into multiple pixels or regions. [4] Regions should greatly reveal to interpret objects. A region is collection of similar pixels. The aim of segmentation is to represent the image into some meaningful form.There are many segmentation techniques. K-mean algorithm is the clustering algorithm which is used to partition an image into k-clusters. Histogram based Method is one of the efficient method of segmentation when compare with other segmentation method. [5] It requires only one pass through the pixels. In this technique, a histogram is computed from all of the pixels in the image, and the peaks and valleys in the histogram are used to locate the clusters in the image. Region Growing Method is seeded region growing method. It takes number of seeds as an input along with the image. The seeds mark each object to be segmentation.Edge detection techniques have therefore been used as the base of another segmentation technique.[6] The edges identified by edge detection are often disconnected. To segment an object from an image however, one needs closed region boundaries. Discontinuities are bridged if the distance between the two edges is within some predetermined threshold.The watershed transformation considers the gradient magnitude of an image as a topographic surface.[7] Pixels having the highest gradient magnitude intensities (GMIs) correspond to watershed lines, which represent the region boundaries.

2.0 Literature Review

Himani S. Parekh et al. (2014) [8] presented a brief survey of different object detection, object classification and object tracking algorithms available in the literature including analysis and comparative study of different

techniques used for various stages of tracking. Different methods for object detection are frame difference, optical flow and background subtraction. Object tracking can be performed using various methods like kalman filter, particle filter and multiple hypothesis tracking. It can be summarized background subtraction is a simplest method providing complete information about object compared to optical flow and frame difference for detecting objects. Kiran .S. Khandar et al. (2014) [9] proposed an algorithm to track an object, moving with an unknown trajectory, within the camera's field of view. To achieve this Kalman Filter (KF) was used for tracking and estimation because of its simplicity, optimality, tractability and robustness. The Single Filter method was implemented. The Single Filter was able to track high speed an error of a couple pixels. By using these series of measurements observed over time, containing noise and other inaccuracies, and produces estimates of unknown variables that tend to be more precise than those based on a single measurement alone. MuammerCatak (2014) [10] proposed a probabilistic object tracking model based on condensation algorithm. A novel object tracking algorithm based on particle filtering associate with population balances was proposed. The developed algorithm was used to track objects in synthetic frames and natural video frames. The color histogram was used as the main feature of the object, and a probabilistic particle filter method incorporating with a novel population balance approach in imaging was proposed to track an object. Population balance equations (PBEs) were used to define phenomena in particulate processes. P.Subhasini et al. (2014) [11] proposed a robust and real-time method for tracking objects. The proposed algorithm included two stages: object tracking, object Segmentation. Object detection is a key step. The concept of tracking object was built upon the object-segmentation method. Motion segmentation was a key step in many tracking algorithms as it forms the basis of object detection. Edge detection technique was used for finding discontinuities in gray level images of tracked frames. Finally segmented frames were converted into video sequence. The proposed method has been tested on a number of video sequences. VishwadeepUttamraoLandge (2014) [12] proposed a method to detect object based on background subtraction method. A reliable background updating model was established. An optimization threshold method was used to obtain behavior of moving object and tracking. Motion of a moving object and tracking in a video stream was studied and detected. Target detection and process is realized on the video image. Video image data of the human body was processed, and its geometrical centre was obtained in different time intervals depending upon color it are getting tracked. Andres Alarcon Ramirez et al. (2013) [13] proposed a novel algorithm for automatic video object tracking based on a process of subtraction of successive frames, where the prediction of the direction of movement of the object being tracked was carried out by analyzing the changing areas generated as result of the object's motion, specifically in regions of interest defined inside the object being tracked in both the current and the next frame. Finally, the location of the moving region of interest in the next frame that minimizes the proposed function of dissimilarity corresponds to the predicted location of the object being tracked in the next frame.

3.0 Research Methodology

In this technique multi object tracking firstly obtain single frame then on the same time in which they measure point from which the image will pitch after that process from using this we reconstruct overlaying image
From that of us in which image will be found for which object will be drawn or object will be recognize that all process cover under image preprocessing. After that target identify using that in which we provide different color for each object and different shape of rectangle draw on each object which cover under extract shape after that finalize object from database or processing with using color feature or shape feature, when target found if yes then determine the object which is operated mean that object will running here and there so their detection will also move along with them, after that locate their position with some end effect or in which from the end they will locate one line with them having same color which is provide to them, after that we will find their parameters like correct detection rate, closeness of track, track completeness, track fragmentation.

4.0 RESULTS

The proposed technique is implemented in MATLAB, and is implemented on the different videos; also results are evaluated in terms of various parameters. Firstly, the technique of Base paper is implemented in which a single type of object is tracked.

Tracking of a single object

Fig 1

After run we have a running video in which a player play tennis and object which is tracked is his face, and this process is done using frames obtained from the video. The same object is tracked in every frame of the video and the process is continue, number of iterations increases but the object which we track that is same as usual. At the end, last iterations complete we get final result from object track identification, now find the values of the factors depending upon their tracking results.

Flowchart of research methodology

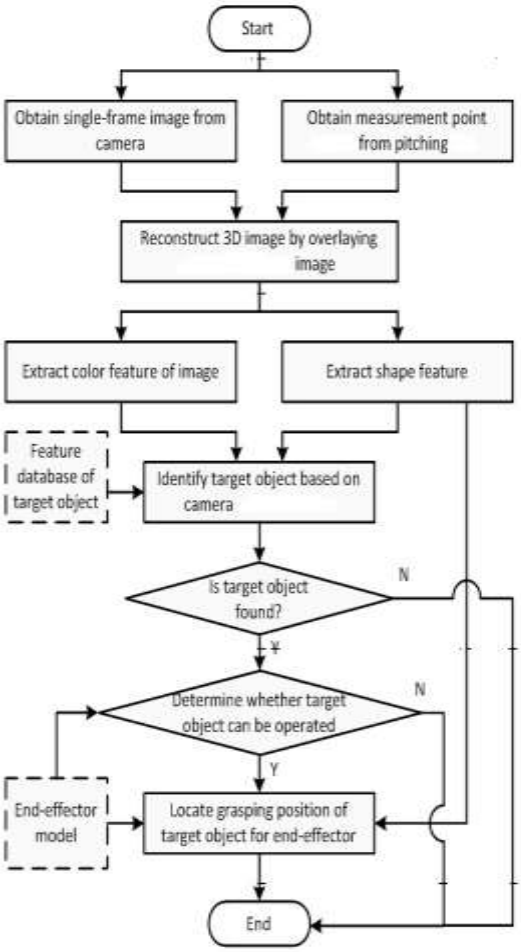

Fig 2

Calculation of parameters in existing algorithm

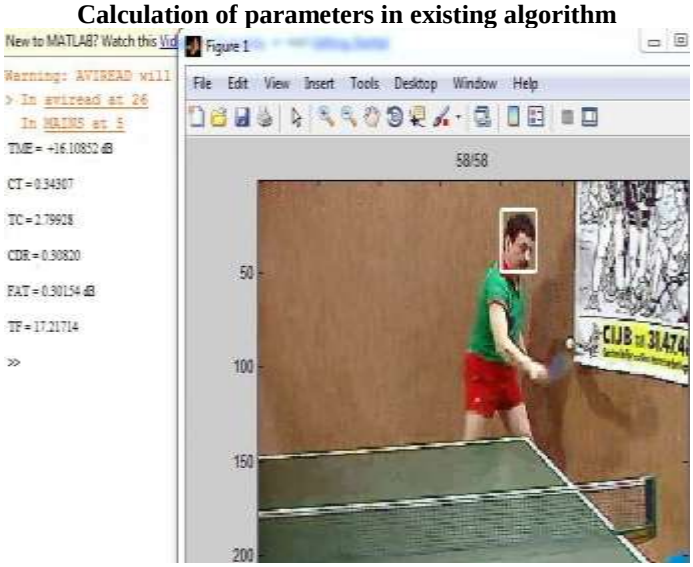

Fig 3

Now, the proposed algorithm is implemented on the other video that is to track the persons in the defined area.

Tracking of multiple objects with different features

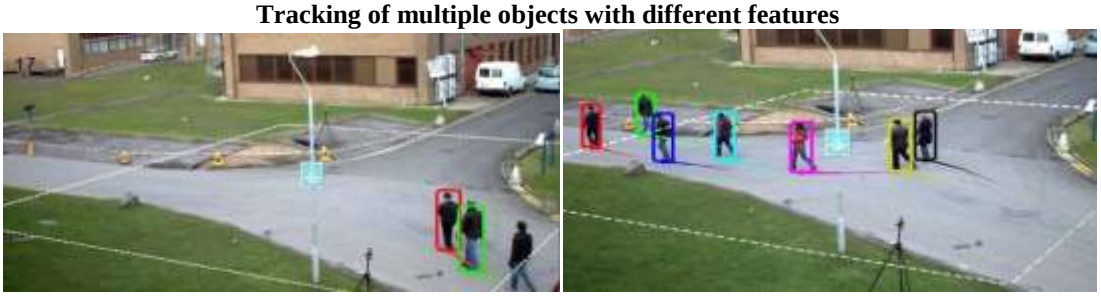

Fig 4

All the persons with different features like height and colour etc. are tracked who walked through the specified area. In the end, when the frames got completed, the parameters are calculated.

Calculation of parameters in proposed algorithm

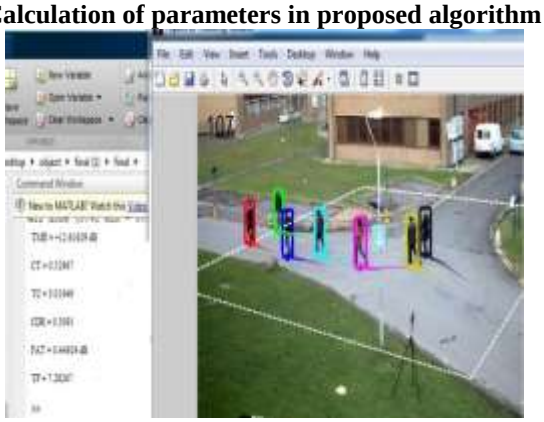

Fig 5

The performance of proposed algorithm is also analyzed on the different video. In the video the multi vehicles are tracked which are of different sizes and types .

Tracking of cars with different features

Fig 6

Track Matching Error (TME) - This TME metric is the positional error between the SUT (System under Test) trajectory and the GT (Ground Truth) trajectory and measures the average distance error between the GT and SUT track. The smaller the TME number, the better the tracking accuracy. [15]

TME Comparison

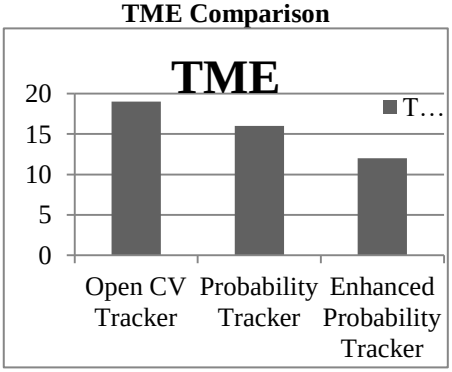

Fig 7:

Closeness of track comparison

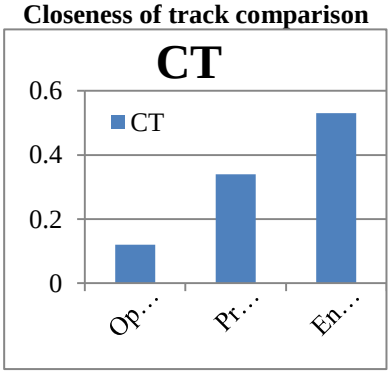

Fig 8

As shown in the figure 7, the compression of the open CV tracker, Probability tracker algorithm and enhanced tracker algorithm, it is been analyzed that enhanced algorithm has maximum value of TME.
As shown in the figure 8, the compression of the open CV tracker, Probability tracker algorithm and enhanced tracker algorithm. It is been analyzed the CT value of the proposed algorithm is maximum as compared to other algorithms.
Track Completeness- TC is defined as the time for which the SUT track overlapped with the GT track divided. [15]

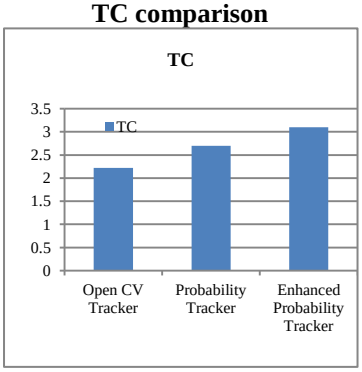

Fig 9

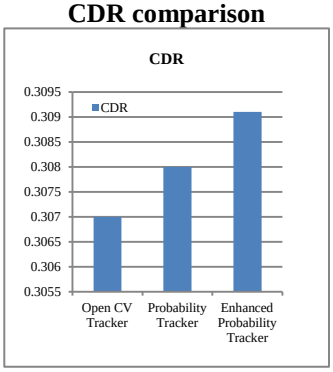

Fig 10

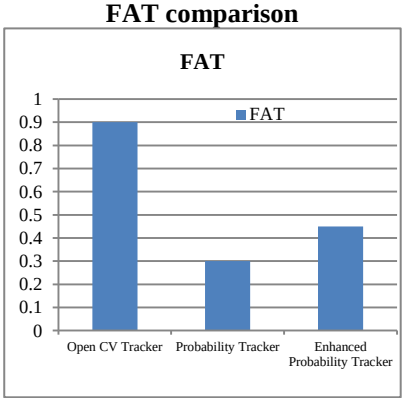

Fig 11

Correct Detection Rate - Correct detection rate is defined as the ratio of number of correctly detected objects and the total number of objects in a video sequence for a given threshold. The rate at which matching of ground truth and object getting tracked is done and there is no reference to the labels assigned. [14]
The CDR value of the proposed algorithm is Maximum as compared to other algorithms as shown in the figure 11, the compression of the open CV tracker, Probability tracker algorithm and enhanced tracker algorithm. It is been analyzed that FAT value is least which means that it is efficient object tracking algorithm than other algorithms.
Track Fragmentation - Fragmentation indicates the lack of continuity of system track for a single GT track. Fig. shows an example of track fragmentation error:

TF=2 (the system track fragmented two times) [15]

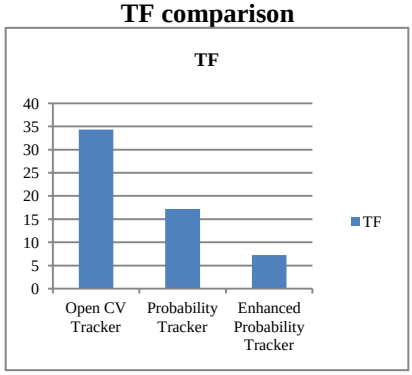

Fig 12

Table 1: Comparison of Algorithms

Parameter	Open CV Tracker	Probability Tracker	Enhanced Probability Tracker
TME	19	16	12
CT	0.12	0.34	0.53
TC	2.22	2.7	3.1
CDR	0.307	0.308	0.3091
FAT	0.90	0.30	0.45
TF	34.34	17.19	7.27

It is been analyzed that TF value is least which means that it is efficient object tracking algorithm than other algorithms.

5.0 Conclusion

In this work, it has been concluded that probability distribution technique track single object from the video. To track multiple objects from the video improvement has been proposed in probability distribution algorithm. In the proposed improvement, technique of filtering is applied in which noise from the frames of videos is removed. The technique of mean shift is used to track multiple objects, in which pixels which have similar location are combined together. To detect multiple objects technique of probability distribution is applied in which future location of the object is detected which have similar properties. The simulation results show that proposed algorithm has 90% accuracy in tracking multiple objects from the video. In future proposed technique will be further improved to track objects which are not of similar sizes.

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