Detecting and Counting Moving Objects using GMM and High Accuracy Streak Flow

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Abstract— Automatic scene analysis has been very favorite topic for researchers in past decade. Performance of system can be improved by using automatic scene analysis, most likely in security and business applications. Visual occlusion and complex behavior of object make this task more difficult. This paper focuses on visual tracking for counting of the persons in a static area. Proposed method uses hybrid model using Gaussian Mixture Model and Optical Flow method. Conventional Optical Flow method has poor anti-interference performance and heavy aberration would be brought to the calculation of optical flow field. This difficulty is solved in this paper by using introducing variational model in Streak Flow. Proposed method is implemented in MATLAB and result shows that that proposed method performs better than some of State of Art methods.

Key words: People Counting, Optical Flow, GMM

I. INTRODUCTION

Knowing the accurate number of persons in a building, building-floor, or a solitary room can be basic for the achievement of business or salvage operations. In this manner, malls, are required to know the precise number of persons present in their premises, anytime. People counting system and video surveillance system is implemented; each of these frameworks is normally devoted to a solitary errand; either numbering or checking the general population inside a specific region. Despite the fact that they are working inside the same territory and performing related errands, they typically don't cooperate in any case and in this way don't profit by the data gathered by the other framework. Furthermore, human tallying frameworks commonly appraise the quantity of individuals going through an entryway by checking the quantity of times a light emission, e.g. infra-red light, is interfered. Thus people counting system is very important in modern day scenario.

Despite the fact that it is extremely basic, such a framework can be extremely proficient in situations where no two persons, or items in mechanical creation lines, go through the checked door in the meantime. They come up short, be that as it may, to precisely tally the number of individuals going through an entryway of a shopping center which is ordinarily sufficiently wide to permit a few persons to enter without a moment's delay. In addition, these frameworks don't recognize passing persons and questions, for example, trucks on the other hand child strollers. For all the reason new framework proposed that can precisely include individuals a solitary room or a gathering of shopping centers, joining the current bar based checking frameworks and video surveillance frameworks.

Notwithstanding, every one of these techniques above depend on customary optical stream strategy and have poor against obstruction execution. The calculation of optical stream field between casings may have expansive deviation,

For Navigation frameworks and surveillance frameworks, object tracking is a basic step. Object tracking is very important in real time world because it has applications like security and surveillance which is used to recognize people. Distinguishing the moving persons in respect to the entire picture is the real assignment of it. Identifying moving items is the establishment of other propelled applications, for example, target tracking, targets characterization and target behavior understanding [1]. Distinctive strategies are accessible for the location of moving item from video. Spatiotemporal Difference, Background Subtraction, Optical Flow and Block Matching Method are the main object detection methods.

Transient distinction registers the contrast between a few back to back edges. It is great at adjusting to the dynamic situations, however for the most part poor at separating enough pertinent component pixels, coming about gaps being created in the moving object. This strategy depends on straightforward convolution so this technique is quick and easy to actualize. Be that as it may, adjacent to all these favorable circumstances, this technique is defenseless to commotion and to varieties of the timings of developments. Background subtraction can extricate the most exact frontal area by displaying the background. Background subtraction strategy utilizes the present casing short the reference foundation picture. The pixels where the contrast is over an edge are delegated the moving article The Mixture of Gaussians strategy is generally utilized for the background displaying [2]. In any case, it is delicate to scene changes brought about by light and climate and so on.

Optical Flow shows a clear change of a moving article's area or twisting between frames. There are two unique strategies for optical flow i.e. 1) Lucas-Kanade and 2) Horn-Schunck. Optical stream estimation yields a two-dimensional vector field, i.e., movement field that speaks to speeds and headings of every purpose of a picture succession [3]. Optical flow gives all movement data. In any case, optical flow calculation strategies ordinarily are excessively mind boggling to use progressively applications if without extraordinary equipment [4]. Piece coordinating systems match obstructs from the current frame with pieces from a reference outline.

The goal of following is to set up correspondence of items and article parts between back to back frames of video. It is a noteworthy errand in the greater part of the reconnaissance applications since it gives firm fleeting information about moving items which are utilized both to upgrade lower level handling, for example, movement division and to empower more elevated amount information extraction, for example, action examination and conduct acknowledgment. Object tracking can be characterized into four noteworthy classifications: district based tracking, dynamic shape based following, element based tracking, and model-based tracking. Distinctive techniques have been connected in such manner to accomplish successful

movement following like Template Coordinating, Histogram Based Tracking, Contour Based Tracking, Particle Filters, Mean Shift Tracker, Kalman Tracker, SVM Tracker, Optical Flow and so on [1].

II. RELATED WORK

In this anticipate, for object identification and tracking, the hybrid strategy is utilized for better recognition and with precise tracking. Proposed method uses two strategies, first is Adaptive Gaussian Mixture Modeling, which is background subtraction strategy and second is Modified Optical Flow. Gaussian Mixture Modeling is generally utilized for background subtraction since it is straightforward and quick strategy. Likewise it can be utilized as a part of the setting of a complex environment. GMM in Object tracking is proposed in [9]. GMM is not a complete item following so that optical Flow used with Gaussian to give complete tracking and counting persons. Optical Flow can be utilized for snappy figuring with basic background. Foreground extracted from the Gaussian Mixture Modeling will be used in Modified Optical Flow. Too optical Flow requires more watch over real time implementation. So this issue need to take thought while usage.

A Gaussian Mixture Model (GMM) is a parametric probability density function represented as a weighted sum of Gaussian component densities. GMMs are commonly used as a parametric model of the probability distribution of continuous measurements or features in a biometric system GMM parameters are estimated from training data using the iterative Expectation-Maximization (EM) algorithm or Maximum A Posteriori (MAP) estimation from a well-trained prior mode. A Gaussian mixture model is a weighted sum of M component Gaussian densities. The complete Gaussian mixture model is parameterized by the mean vectors, covariance matrices and mixture weights from all component densities[5].

GMMs are generally used in Speaker Recognition, Speaker Modeling and Speaker Matching, because of their ability to represent a large class of sample distributions. One of the effective qualities of the GMM is its capacity to frame smooth approximations to subjectively molded densities. The traditional uni-modular Gaussian model speaks to highlight dispersions by a position (mean vector) and an elliptic shape (covariance lattice) and a vector quantized (VQ) or closest neighbor.

Optical Flow is a method used to portray picture movement. It is typically connected to a progression of pictures that have a little time venture between them, for instance, video outlines. Optical Flow ascertains a speed for focuses inside the pictures, and gives an estimation of where focuses could be in the following picture succession.

Optical flow reinforces the relative motion of objects to the viewer (velocity, disparity, and intensity). It can impart information about the spatial arrangement of the objects viewed, and the change rate of this arrangement. Discontinuities in optical flow can segment images into regions that correspond to different objects. Two factors cause difficulties in computing optical flow: satisfying the brightness constancy assumption by many different motions in homogenous regions; and violating the brightness constancy assumption at boundaries of moving objects by such effects as changes in lighting, nonrigid motions, shadows, transparency, and reflections. Most of the optical flow methods have poor anti-interference performance. The computation of optical flow field between frames may have large deviation, and this will result in incorrect segmentations. Furthermore, these methods cannot recognize flow spatio-temporal changes in crowded scene quickly and accurately, especially in local areas[29].

Proposed model is given for real time application. Additionally the recognition procedure is blend of two understood visual tracking systems i.e. Versatile Gaussian Mixture Model and Modified Optical flow. First taken continuous information video grouping is given to the background subtraction model which overhauls background constantly. At that point Gaussian Mixture Modeling is accomplished for extraction of frontal area. At that point middle channel is utilized for the shadow evacuation and morphological operation is accomplished for filling the vacant openings in picture to expand the smoothness of the picture. At that point frontal area is removed from the video scene.

III. PROPOSED MODEL

This extricated forefront is utilized by the modified optical flow as a kind of perspective frontal area. Optical flow gives all the data of the moving person in the structure vectors. For Optical flow, high accuracy strategy proposed in [6] is utilized here. At that point by utilizing optical data moving person is distinguished from the video. Utilizing blob investigation the limit box is limited on the distinguished on the image. At that point after distinguished person/object is followed utilizing high accuracy optical flow technique.

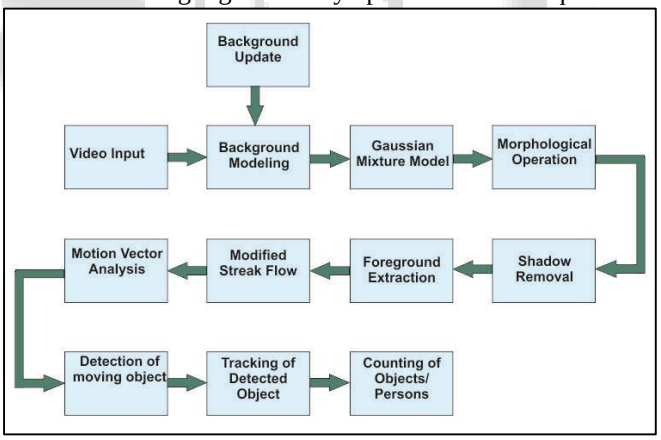

Fig. 1: Block diagram of proposed system

A. Modified Streak Flow Method

To solve problems in optical flow method, Yang et al proposed a new method that mainly combines a high accurate variational model with the streakline framework. The streakline framework could recognize spatial and temporal changes about the crowded scene in time, but the accuracy and anti-interference performance were unsatisfactory because this framework was also based on traditional Lucas Kanade optical flow method [13]. Furthermore, the formulation of streak flow similarity in this framework ignored some kinds of cases which could result in the incorrect segmentations in local areas.

In modified streak flow the high accurate variational model is adopted to compute the optical flow

field between frames. Because of the high accuracy and strong anti-interference performance of optical flow field using the high accurate variational model, the new obtained streaklines and streak flow, based on this variational model, have strong anti-interference performance and can provide a better way to recognize flow spatio-temporal changes more accurately in the scene, especially in local areas.

IV. EXPERIMENTAL RESULT

The most effective method to recognize object in a video arrangement utilizing frontal area finder in view of Gaussian blend models (GMMs) and extricated closer view use as reference for following article with utilizing optical stream. Instead of promptly preparing the whole video, the case begins by acquiring an underlying video outline in which the moving articles are sectioned from the foundation. This serves to steadily acquaint the strides utilized with procedure the video (avi,mp4).The closer view identifier requires a specific number of video casings keeping in mind the end goal to instate the Gaussian blend model.

Object tracking and counting evaluation can be done on various parameters like sensitivity, precision, specificity, f-score and speed. The evaluation within this thesis does not include individual scores for sensitivity, specificity or f-score for each metric. Proposed method is evaluated on the parameter like precision and recall.

Recall. Given a ground truth GT_j and a tracking estimate ε_i, the recall, $\rho_{i,j}$, is expressed as

$$\rho_{i,j} = \frac{|\varepsilon_i \cap GT_j|}{|GT_j|}$$

Recall measures how much of the GT is covered by the E and can take values between 0 (no overlap) and 1 (fully overlapped)[30]. Precision $V_{i,j}$, is defined similarly as

Method Used	Input Video	moving object	Object Detected	Correct object	Missed object	Recall
Optical Flow Method	visiontraffic	7	6	6	1	85.5 %
	atrium	21	23	17	3	66%
Proposed Method	visiontraffic	7	7	7	0	100 %
	atrium	21	25	21	0	81%

Table 1: Recall

Method Used	Input Video	moving object	Object Detected	Correct object	False object	Precision
Optical Flow Method	visiontraffic	7	6	6	0	100%
	atrium	21	23	17	0	74%
Proposed Method	visiontraffic	7	7	7	0	100%
	atrium	21	25	21	0	84%

Table 2: Precision

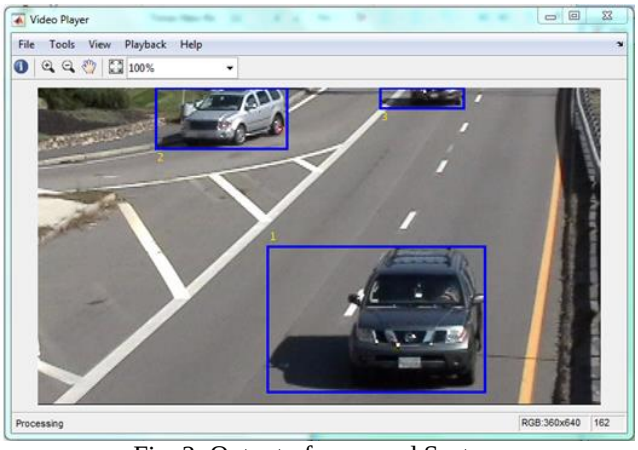

Fig. 2: Output of proposed System

$$V_{i,j} = \frac{|\varepsilon_i \cap GT_j|}{|\varepsilon_j|}$$

Proposed method performs better in terms of Recall and Precision. Table I depicts the Recall of proposed framework and optical flow method when applied on different video inputs using MATLAB. Table II depicts the Precision of proposed framework and optical flow method when applied on different video inputs using MATLAB.

V. CONCLUSION

Now a day's object detection, tracking and counting has attracted attention of researchers. Many paper presented in object tracking and have different advantages and disadvantages. Paper presented a hybrid method to track moving object and count persons/objects in area under test using video input. Proposed method improve the performance of visual surveillance system. Our method introduces three major changes in conventional method for tracking and counting system. First, proposed method used Gaussian Mixture Model which is generally used in speaker identification. Gaussian Mixture Model used in foreground extraction. GMM makes the algorithm more robust, such that the tracker will recover tracking if occlusion occurs.

Second, proposed method introduces Modified Optical Flow method which increases the accuracy of the conventional optical flow method. Instabilities at the boundaries of moving objects are still challenges in object tracking. A difficult part of the optical flow problem is how to accurately and quickly detect and readjust unstable regions at the boundaries. Modified optical flow method detects and quickly readjusts unstable regions at the boundaries of moving objects in general and compact manner.

Our algorithm supports increased accuracy of traditional tracking and counting system. Only disadvantage of this method is the increased computational complexity but the time required is not increased.

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