Crowd Behavior Analysis Using FAST Features

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***Abstract*—Crowd behavior analysis is an active research topic in a video Surveillance for public security. Computer vision based approaches there are two types of behavior understanding problem: behaviors analyzer of individuals in a crowd (object-based) and using the knowledge to make deductions regarding the crowd behavior and analyze the crowd as a whole (holistic-based). In this proposed system is used holistic-based used, phase to analyze segmentation method using optical flow. Next we calculate clustering algorithm using k-means that dependence on the number of clusters (k), and the dependence on the initial choice of the clusters' centroids. Moreover, our methodology guarantees creating high accurate clusters and defines Merging and Splitting of crowd behavior.**

***Index Terms*— Crowd behavior, FAST Feature, Key Frame Selection, k-clustering, Video Surveillance**

I. INTRODUCTION

Crowd behavior analysis is an interdisciplinary issue. A crowd is a large group of people who are in close geographical or logical states. Crowd behavior analysis in computer vision research delivers new application domains, such as automatic detection of riots or chaotic acts in crowds, localization of the abnormal regions in scenes for high-resolution analysis, group behavior recognition, and performance evaluation.

It is not surprising; therefore, that crowd behavior has received attention from technical and social research discipline. Crowd behavior is of great in a large number of applications: In particular behavior analysis of crowded scenes is of great interest in large number of crowd application [1], such as

- Crowd Management: Crowd analysis can be used for developing crowd management strategies, especially increasingly more frequent and popular events such as sports event large concerts, public demonstration and so on, to avoid crowd related disasters and insure public safety.
- Public Space Design: To provide guidelines for the design of public spaces. e.g. to make the layout of shopping malls more convenient to costumers or to optimize the space uses of an office.
- Virtual Environments: It can be used to validate or increase the performance of the mathematical models used in crowd simulations. Visual Surveillance It can be used for automatic detection of anomalies and alarms.
- Intelligent Surveillance: It can be used to take decision on how to split crowd in museum, based on their behavior. For example, in a museum deciding how to divert the crowd based on the pattern of crowd.

Visual perception of objects, activities, and events are among the marvelous capabilities of the human mind that are developed early childhood. The human vision system is capable of performing computationally complicated tasks such as detecting or counting similar objects in a scene, in spite of occlusion and clutter, seemingly.

Effortlessly research Scientists in the computer vision community effortlessly. Research scientists in the computer vision community have been developing mathematical tools to detect objects, recognize objects and actions, and discover behaviors and events in visual scenes comparable to human capabilities. In all these efforts, the understanding of human activities is of a special interest for both application and research purposes. It paves the way for understanding the development of human visual cognition and interaction skills.

For example, the annual Muslim Hajj in Mecca, Saudi Arabia, which is attended by millions of pilgrims, has increasingly suffered from stampedes, even as authorities have constructed new walkways and instituted other traffic controls to prevent them. Similar incidents have reported in India during Hindu religious holidays [10].Moreover, stampedes may happen in social and political gatherings in case of crowd panic. For example, on 4th of March 2010, crowd panic emerged after hearing someone yelling the word "bomb" and it created a stampede, which ended up in injuring several people [11].The King's Cross underground fire in London in 1987 gave the field one of its starting shoves. One big danger in an emergency is that people will follow the crowd and all herd towards a single exit. That in turn means that the crowd may jam as too many people try to force their way through a single doorway. [12]

To improve the coordination of the crowds and to facilitate the flow of the people in public spaces, the transportation researchers are increasingly interested in ameliorating urban designs to adapt them to public needs and habits. Very limited research efforts have been made on understanding the coordinated human actions in groups which it can create a new area of research in human computer interaction. For instance, an automatic system to recognize and evaluate group performances or group sports would help instructors and learners in improving the group executions tremendously.

Jacques junior et al. [1] crowd behavior analysis classified based on two approaches "object-based approaches" and "Holistic-based approaches".

A. Object-based Approaches

Chen et al. [2] proposed approach based on graph-based modeling . In this analyze individual person or set of occulted person is detected by background subtraction. To construct a graph, Delaunay Triangulation is used to methodically connected vertices and therefor the problem of event detection of human crowd is framed is measuring the topology variation of consecutive graph in temporal order. To effectively model the topology variation, local characteristics such as triangle deformations and eigenvalue- based sub-graph analysis, and global features such as moments are all computed and finally combined as an indicator to detect if any anomalies of human crowd(s) present in the scene.

Alqaysi et al. [3] proposed approach-automated algorithm for the detection of abnormal behavior in Dynamic Crowded Gathering (DADCG) is reduced the processing speed, sensitivity to noise and improve accuracy. In this analyze individual action recognize and detected crowd. The MHI technique reduced the sensitivity to noise, and Lucas-Kanade method reduced the processing speed. The segmented histogram has improved the result of localized analysis. Moreover, this method ensures people's privacy, since it does not detect and track individual people.

Coppi et al. [9] proposed traced separate tools and schemes (i.e. graph, Laplacians and transductive learning). Their combination with a strong statistically well- founded update strategy has led to a dominant tool especially for observation and forensic uses. In this system represent tough tracing which differ from tracking system. It uses transduce and spectral properties of graph Laplacians proposing a formulation of the people tracing problem as a semi-supervised ordering. It's give effects in up and negative samples of target.

B. Holistic approaches

Calle silos et al. [4] proposed method based on mid-level spatio-temporal features that characteristic motion of typical event in crowd behavior. In this spatio-temporal feature characterize motion of explicit event detection and distance based anomaly detection tasks.Furthermore, Its have suggested an automatic feature selection approach. It has assessed the proposed feature set for explicit even detection on the PETS dataset and our results compare favorably to the state-of-the art. And also evaluate the feature set for anomaly. Detection on two datasets, PETS and Web dataset, obtaining again quite competitive performance.

Lee et al. [6] proposed motion influence matrix to analyze crowd behavior. It is generated based on concept of human perception with block-level motion vectors, which describe actual crowd moment. It has main advantages of that does not require to segmentation method to crowd analysis. Unlike most of previous methods, which focused on either global or local abnormal behavior detection, we can detect global and local behaviors in a proposed single framework. This paper has two-main contributions. First, a novel crowd motion representation method, which can characterize crowd behaviors. It considers both moving object's motion and appearance. Second, we develop a generalized framework in which we can detect abnormal behaviors utilizing the proposed motion influence matrix.

Andersson M. [7] presents a framework for crowd analysis that can handle both light and significant crowds, by merging micro and macroscopic mass analysis methods. The paper focuses on discovery, rushing and behavior of dense crowds. We use multiple impartial tracking (MTT), mass tracking, K-means clustering and hidden Markov simulations (HMM). K-means clustering is used to resolve if micro- or macroscopic approaches should be used. A first estimation, based on documented and replication data sets, has been done. The evaluation shows that MTT works well when the crowd is equally sparse. When the crowd becomes intense track identities are easily switched between tracks.

Yogameena B. [8] presents an quick observation algorithm for estimating the peoplecounts in a crowd and also categorizing the crowdbehavior as normal or abnormal is proposed. This method chains the machine knowledge and threshold based algorithms (Ma-Th) to estimate the peoplecount and crowdperformance consideration. First, the foreground is segmented using ViBe algorithm. Subsequently, the features are extracted using bounding box selves such as crowd density, virtual height/width, foreground pixel's horizontal/vertical mean.

Zhang et al. [9] proposed BOTG (Bag Of trajectory Graph) is presented dense crowd event recognition. In this crowd particles are composed of atomic subgroup to informative behavior patterns, particle trajectories, which simulate motion individual, will be clustered to form at the first step. Result: "graph structure + group attribute" stands for Walking, Running, Formation, demon-standing those behavior pattern are quite related to motion information. Second step connect nodes in each group as a trajectory graph and discover informative features to depict graph. Result "graph structure + group attribute" represent global and local desperation. Third step to analyze method Bag of Trajectory Graphs occurrences of behavior patterns, which provides categorical specific crowd event and detecting abnormality. Result was third attribute less significant compare to graph structure when combining with the motion shown in dark blue bar.

II. PROPOSED SYSTEM

In the Proposed system shown in Fig (1). In this phase evaluate different different step to evaluate crowd behavior on Merging and Splitting.

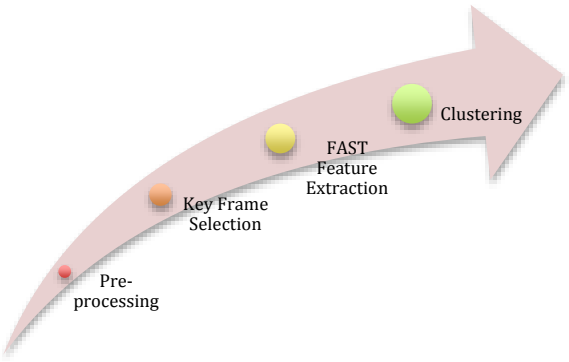


Fig 1 Proposed Method Pipeline

- *Proposed Algorithm*

Proposed Algorithm	
Step 1.	Input Video From File
Step 2.	Optical flow based segmentation
Step 3.	Morphological Operation
Step 4.	Key frame selection ▪ Area ▪ Bounding box analysis ▪ Centroid
Step 5.	Extract FAST Feature
Step 6.	Find out optical no of clutter scenes
Step 7.	Apply K-means clustering
Step 8.	Rank based from merging and splitting given
Step 9.	Display result of video

1) Pre-Processing:

Optic flow is the display of motion of entities in a visual scene caused by the comparative motion concerning the scene and an eye (a camera). Optical flow process used for particular fields such as accepting better video density, image dissection for tracking a moving entity and motion estimation to predict the motion vector of a moving entity. It represents an obvious change in position of a moving object. Optical flow technique profits a two-dimensional vector, i.e., motion vector (MV).MV indicates the velocities as well as the directions of each pixel of two sequential frames in a time sequence.

2) *Key Frame Selection:*

After segmentation, selected key frames can current the matters of a video segment, so that the compensation of the video database is greatly compact.Key frame is the image frame that is representative in aseries of images and can reflect the general subjects of the video segment. Via the video segmentation technique in, surveillance video is distributed into basic units within which the matters are similar. To proceed, we can select the key frames from these components and make them represent the contents of the basic components. Because a surveillance video is shot under a fixed occasion, the scenes recorded are almost the same and there is a large aggregate of redundant information in the frames of the video segments. Thus, the selection of key frames can commendably keep the main matters of the video meanwhile greatly decrease the amount of information controlled in this video. As a result, the video segment rescue rate is improved dramatically.

Generally, the key frame assortment is based on two purposes: first of all, it is capable to present the matter and part of the contents of the video; in addition, it can change the research on active video into that on static images, which streamlines the research as well as obtains the features of the key frame, such as color, outline and shape, and makes them the date sources of video abstract record table. According to the feature of surveillance video, the variance between two segments centers on the variances of moving objects and the brightness of light. Surveillance video is segmented allowing to Movement Amount. Here we apply a more simple approach to select key frame, i. e. choosing the starting frame of a video segment as its key frame.

3) FAST Feature Extraction:

The selection of features directly impacts the eventual results. The shapes and spatial relations of moving objects are significantly influenced by the division of images, meanwhile spatial relations are sensitive to the transportation and rotation of moving objects, so they cannot be used in the retrieval of surveillance video. Based on the above consideration, here we mainly apply the FAST feature to describe the contents of images.

We have got all the potential key points. These points must be sharply distinguished from its surrounding regions, i.e. key points should not be low contrast, and temporarily it should not be edge point. During the process of key point determination to accurately calculate the locations and scales of key points and meanwhile delete the low contrast or edge points.

4) Clustering

Here, k- means clustering approach is manipulated. Having an initial numeral of clusters from the previous step, we now apply extra similarity measure to refine our cluster members. Calculate the Euclidean distance among the cluster centroid and the new segment, based on the curtailing value the segment is either inserted into the cluster, or is tested beside other existing cluster with the same orientation, or generates a new cluster with the new section as the opening centroid. The centroid of the cluster to which the segment is included is recalculated to take the new segment position into account. The new centroid is thus a virtual portion with same emphasis as other segments in the cluster, and its locus is the average of the spatial loci of the outstanding cluster members. According to that classify crowd as 2 ways:

1. Merging:

Silhouette Coefficient method for centroid point measure in k-mean. Using that we evaluate the nearest point detection and measure the distance between two objects. Distance between two objects reduces and centroid point of two objects combine to each other and that time period of event should occur and define the behavior merging. And define this object differentiate various color based cluster.

2. Splitting:

Splitting behavior also define on silhouette coefficient for centroid point selection. In this define how many no of cluster on moving object. And object are moving far and its come to its centroid detection and define its splitting.

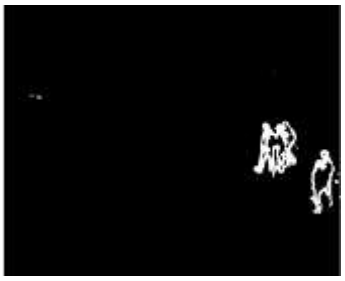
III. EXPERIMENTAL EVALUATION

A. Merging:

We show the experiments and the results of our approach in this section. We first focus on the velocity detection using videos from PETS 2009 standard dataset. After that, we experiment the divergent center detection approach using the synthetic and real vector fields, and the real vector fields include in the videos.

Shown in frame no 16 (a) is a Segmentation method based crowd evaluation. Frame No 16 (b) define the crowd merging behavior.

Table I shown the different video on PETS 2009 dataset evaluation on merging event. No of true frame detection and no of false frame detection we evaluate based on centroid point detection and no of cluster occur on it. If the centroid point detection nearest point and merger the centroid of the object that session define the crowd merging and we evaluate more accurate result on it.



Frame No. 16 (a)

Frame No. 16 (b)

TABLE I

PETS VIDEO	Crowd Behavior Analysis For Merging		
	True Frame	*False Frame*	*Accuracy*
S0_RF\Time_14_06	108	15	93%
S1_L3\Time_14_17	137	13	91.33%
S3_HL\Time_14_16	103	8	92.79%
S1_L2_Time_14_31	140	10	93.33%

a) Splitting:

Shown in frame no 8 (a) is a Segmentation method based crowd evaluation. Frame No 8 (b) define the crowd merging behavior.

Frame No 8 (a)

Frame No 8 (b)

Table II shown the different video on PETS 2009 dataset. Here we evaluate different time of video event evaluate on it. When number of cluster and centroid point detection are far we evaluating the crowd as a splitting event. No of true frame and no of false frame occurs on different video and we accuracy measure on according to number of frame event occure on it. Define the cluster according to splitting event.

PETS VIDEO	Crowd Behavior Analysis For Splitting		
	True Frame	*False Frame*	*Accuracy*
S0_RF\Time_14_03	143	7	95.33%
S2_L2\Time_14_55	141	9	94.00%
S0_CC\Time_12_34	139	11	92.66%
S2_L3\Time_14_41	142	8	94.66%

IV. CONCLUSION

The computer vision approach tackles the problem of automatically extracting information sufficient to characterize some unique crowd behavior. In this thesis we proposed a Pre-processing step to analyze segmentation method using optical flow. Next phase evaluate key frame can present the contents of a video segment, so that the redundancy of the video database is greatly reduced, Feature Selection point for edge detection, Next we calculate clustering algorithm that Extends the k-means algorithm that dependence on the number of clusters (k), and the dependence on the initial choice of the clusters'centroids. Moreover, our methodology guarantees creating high accurate clusters and defines Merging and Splitting of crowd behavior. .

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