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Crowd Behaviour Analysis

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Abstract: ***In today's scenario, video surveillance plays an important role. Leading it to be most popular in security applications. Here the question arises what makes it more popular? The answer o this question is its ability to recognize abnormal behavior in a video sequence and further analysis of their behavior has drawn the attention towards the popularity of video surveillance, since it allows filtering out a large number of useless information, which guarantees the high efficiency in the security protection, and save lots of human and material resources.***

In this paper, we present crowd behavior analysis i.e. this paper provides a video surveillance framework for event recognition in a crowded scene to detect the abnormal human behavior. We proposed a human tracking method based on the Lucas-Kanade optical flow algorithm. This optical method provides the feature for object detection and tracking know as optical flow vector.

Keywords: Crowd; Motion detection; Optical flow estimation; Motion vector; Object velocity and direction

1. INTRODUCTION

Let's just imagine a system that takes video from surveillance cameras, understands when something abnormal occurs and relays this information to the relevant user. This would free up the human resources that are now being used to monitor video from these cameras. In the last few years as computer power has increased and the internet has become accessible from almost anywhere there have been breakthroughs in video surveillance. With good compression algorithms available and increased storage space, many days or weeks of video can be saved and more cameras can be connected to the same computer.

There are many techniques that exist and are used to differentiate human behavior in a different environment.

Many of the distinct crowd behaviors include a group of people going in wrong direction, a sudden fast motion of vehicles, people running etc. Thus along with the information about the crowd activity it is important togather information regarding the factors such as its velocity and the direction. Hence, it is a difficult task for calculating velocity and direction of an active crowd [3,4]. In order to deal with this challenge effectively optical flow algorithm is most efficient method. Optical flow method detects independent moving objects based on their velocities. This method provides features for both i.e. object detection and object tracking which is also known as the optical flow vectors.

These vectors are used to represent velocity and the direction of moving pixel. The optical flow methods provide information about the spatial displacement of the pixel and the rate of change of this displacement. The object detection is done by their features and further tracked by matching the same features in succeeding image frames.

2. PROPOSED METHODOLOGY

Since cc cameras are installed at every corner of the busy areas, majority of the crowd is under surveillance. Basically, the codes are derived of human activity and behavior. For example, how the crowd activity reform? What will be their behavior? etc;

There are number of abnormal activities. This project mainly focuses on the object motion and uses this motion to further classify the crowd into normal and abnormal of their behavior.

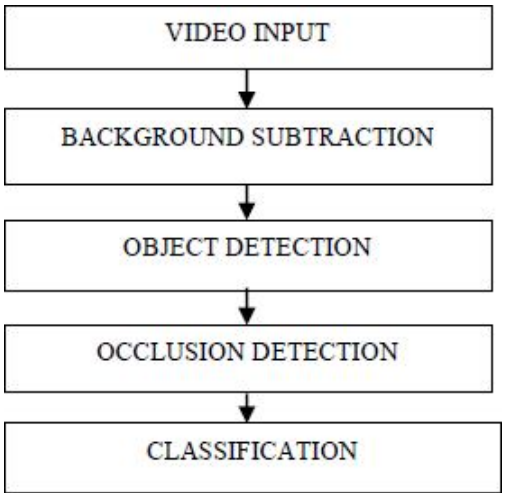


Fig 1: flowchart of system

1) VIDEO INPUT

Capturing video from the static camera

2) BACKGROUND SUBTRACTION

To lower computation and to only take foreground into account it is necessary to perform background subtraction, or in another word, foreground segmentation.

3) OBJECT DETECTION

Object detection or in the other word corner point detection. In this project for corner point detection Shi-Tomasi corner detection algorithm is used. This algorithm helps in collecting a strong or a good corner point [6]. Since the project is implemented in opencv, here opencv has a function, **cv2.goodFeaturesToTrack().**

Here the image should be a grayscale image. Then we need to specify feature-parameters like maximum corner, where we specify number of corners we want to find. Then we specify the quality level, which is a value between 0-1, which denotes the minimum quality of corner below which everyone is rejected. Then we provide the minimum Euclidean distance between corners.

With all this provided information, the function finds the corner points. All corners below quality level are rejected. Here the function takes first strongest corner and rejects all the nearby corners in the range of minimum distance and returns strongest corners.

Overall this algorithm is used to detect or calculate the "good corner points" in a frame.

4) OCCLUSION DETECTION

Occlusion detection of the object plays an important role in performing object tracking in a crowded scene. Since due to occlusion, it is difficult to perform background subtraction in high- density crowd. For occlusion detection, Lucas-Kanade Tomas Tracker algorithm has been used. In a dense crowd environment, over time the relative position of an object varies leading it to object overlapping each other [5].

Taking into consideration all these aspects, extracting corner as feature points of a moving object along with calculating the optical flow of such points will probably help in reducing the computation cost and provide motion information.

KLT tracker has been utilized for Anomaly detection in a crowd, follows certain stages:

- They extract corners as feature points in order to represent moving objects.
- These extracted corners further tracked by Lucas and Kanade method to create field of motion vectors.
- These motion vectors are enhanced by using a mask.

The KLT tracker has been utilized for Anomaly detection in crowd. They extract corners as feature points in order to represent moving objects and then tracked by Lucas and Kanade method to create field of motion vectors [6]. These motion vectors can be enhanced simply by using a mask which in turn represents the crowd location.

5) CLASSIFICATION

Classification of the crowd has been done by a threshold value.

There's a certain threshold value that has been provided. This value helps in distinguishing the normal and abnormal crowd according to velocity or the speed of motion.

If the velocity exceeds the threshold value then the motion of the crowd is considered as abnormal.

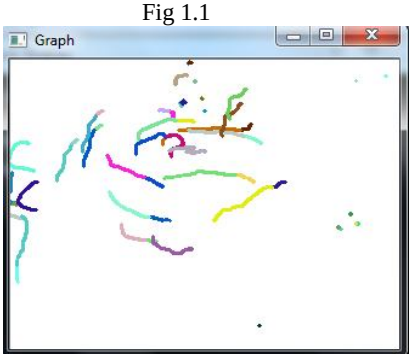
2.1 OVERVIEW OF PROPOSED SYSTEM

Step1: After capturing video, we take the first frame.
Step 2: Detect some Shi-Tomasi corner points.
Steps3:Then we iteratively track those points using Lucas-Kanade optical flow.

3. IMPLEMENTATION AND RESULT

VIDEO 1:

Fig 1.1



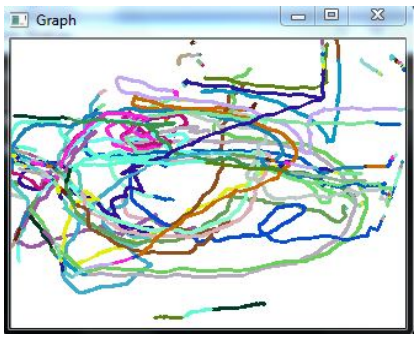


Fig 1.2

The above figure shows the output to the provided input video. Here the algorithm is detecting the normal behavior in the crowd and accordingly the graph shows the motion of the tracked object.

Also in the very second part of the video it flashes the abnormal activity which has been encountered. Similarly, the abnormal motion of the tracked objects has been shown graphically.

VIDEO 2:

Fig: 2.1

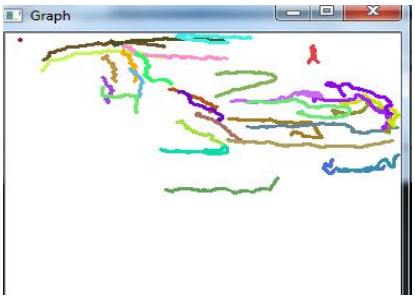
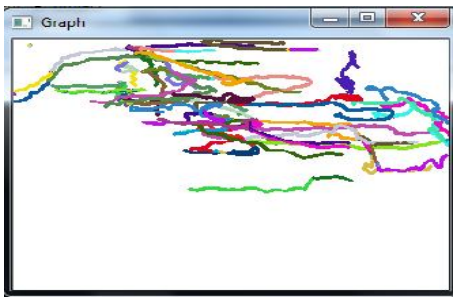


Fig: 2.2



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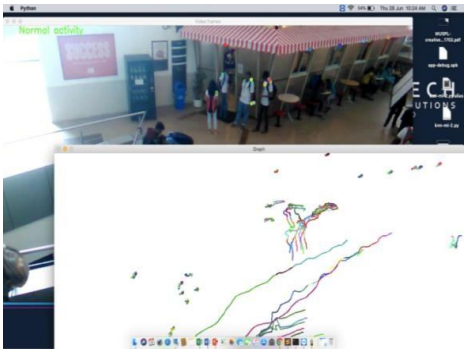
VIDEO 3:



The above figure shows the real time tracking of the objects.

	observation	
videos	***Ground truth***	***output***
Video 1	Frame 1, Scene 1- normal crowd Frame 2, Scene 2- increase in crowd motion	Frame 1, Scene 1- normal crowd Frame 2, Scene 2- abnormal crowd
Video 2	Frame 1, Scene 1- normal crowd Frame 2, Scene 2- increase in crowd motion	Frame 1, Scene 1- normal crowd Frame 2, Scene 2- abnormal crowd
Video 3	Frame 1, Scene 1- people walking	Frame 1, Scene 1- normal crowd

Table 1: shows the summary of result. Where the ground truth signifies the observation by human and the output shows the result of the applied method.

4. CONCLUSION

This approach successfully detected most of the abnormality as compare to the result got manually. However, in order to get a desirable output, it is necessary to choose the favorable threshold carefully.

5. FUTURE SCOPE

The future work will cover how to involve more crowd characteristics into the abnormality detection, such as the number of crowd groups, acceleration of the motion. To improve the accuracy of system, we could also employ more accurate tracking methods to capture some small local motion in the crowd scene.

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