

# Detecting Abnormal Events for Intelligent Video Surveillance System

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**Abstract** - There is need of surveillance system which can monitor and count the movable objects. This surveillance system is widely used in indoor and outdoor areas to prevent the harmful events. We propose techniques to automatically examine and interpret the behavior in the surveillance scene. A large part of the work is devoted to the visual analysis of human and movable object behavior and abnormal event detection. In this context, a working system would alert of dangerous situations by triggers an alarm and improve the personal safety of the people.

**Key Words:** Background modeling, morphology, haar cascade, event analysis, counting.

## 1. INTRODUCTION

Intelligent video surveillance system is widely used in public and private areas to monitor the movable objects. Crowded areas like parking lots, highways, railway stations, airports, malls have to monitor and track using CCTV or IP cameras. In traditional system, person has to monitor video continuously or check video whenever needed.

This technology including detecting, tracking and counting movable objects, analyzing their behaviors, and reply to them [3, 4]. Behavior analysis of human motion, such as periodicity, gestures can be found in [5]. Most challenging part is detection of abnormal events and triggers an alarm. Abnormal events are the situations which are unwanted, unexpected events like person slips or falls, road accidents, fighting, loitering, theft, illegal U-turn of vehicles, pushing, punching etc. Frames are extracted from the video dataset and process this frames to detect moving objects. Background modelling (BM), RGB BM method [1] and morphological operations are performed on extracted frames. By using this methods noise is reduced. To detect moving objects simple region growing algorithm is used. Main part of region growing algorithm is the selection of initial seed points. Region-based segmentation is the technique used to determine the region directly. Region growing algorithm can correctly separate the regions which have the same defined properties.

Face detection algorithm is used to count the humans from the video dataset. It detects facial features using the cascade classifiers.

After detecting moving objects we use static threshold event detection method to detect the abnormal events. In this method, we set threshold value for normal activity. If the parameter exceeds than threshold value then consider as abnormal activity. When abnormal activity is detected then system triggers an alarm.

To track the multiple moving objects Euclidean distance formula is used. The procedure consists of predicting the position of each object, recognizing the homogeneity of each object in the sequential frames, and identifying the newly appearing and disappearing object.

## 2. MOVING OBJECT DETECTION

It deals with the process of detecting moving objects from the input image. It consists of the extraction stage based on RGB BM and morphology. The extraction of moving regions from sequential input images is performed by using BM. This gray scale BM involves the loss of image information and excessive attenuation. RGB color model is used to prevent this excessive attenuation and it has shorter execution time.

Morphology is used to eliminate the noise. The erosion operation of morphology removes the noises, and the dilation operation of morphology recovers the loss which made in the process of the erosion [2].

## 3. REGION GROWING ALGORITHM

Region growing is a simple region-based image segmentation method. It is a pixel-based image segmentation method which involves the selection of initial seed points. It examines neighboring pixels of initial "seed points" and determines whether the pixel neighbors should be added to the region.

The main goal of segmentation is to partition an image into regions. Another segmentation method is "thresholding" which is going for the boundaries between regions based on discontinuities in gray levels or color properties.

### 3.1 BASIC CONCEPT OF SEED POINTS:

In region growing, first step is the selection of set of seed points. This selection is based on some user criterion like, pixels in a certain gray-level range, pixels spaced on a grid, etc. After selection of the seed point, region begins from the location of seed point. This region is grown from the selected seed point to the adjacent point and it is depending up on the region membership criterion. Criteria like, pixel intensity, grey level texture, color etc. To grow the region criterion and image information is also important. For example, if criterion is a pixel intensity threshold value, knowledge of the histogram of image is used. It is used to determine suitable threshold value for region membership criterion.

## 4. FACE DETECTION ALGORITHM

Face detection is a computer technology that determines the locations and sizes of human faces in digital images. It detects only the facial features and ignores anything else, such as birds, building, trees and bodies. Face detection can be used for face localization. Task of the Face localization is to find the locations and sizes of a known number of faces.

### 4.1 FACE DETECTION USING HAAR CASCADES

There are 6000 features to apply on window. This is very lengthy and time consuming process. To overcome this group this features into different stages of classifiers and apply one by one on window. Apply first stage on window, if it fails discard it and go for second stage and so on. If the window passes the stage no need to go for remaining stages. If window passes all the stages it consider as a face region.

## 5. Event Detection

Static threshold event detection is the simplest and straightforward method of statistical event detection. Event detections are reported when the monitored parameter exceeds a predetermined threshold value, and the detection condition persists as long as the parameter value exceeds the threshold set point. Once the parameter falls below the threshold value, the detection condition clears. Threshold values are based upon historical parameter values, parametric analysis or engineering estimates. The static threshold method is a "memory less" property from one observation to the next, because the current observation and detection condition is independent of all previous observations.

## 5.1 NORMAL EVENTS

After analyzing the events from the training dataset, events like handshaking, hugging, pointing is considered as normal events.

## 5.2 ABNORMAL EVENTS

Here, we consider pushing, punching, kicking are the abnormal events. Lower body part is considered to detect abnormal events. Threshold value  $90^\circ$  is set. Angular distance between the two legs is  $90^\circ$ .

## 6. EXPERIMENTAL RESULT

Proposed algorithm of abnormal event detection was successfully tested on recorded datasets. We use the different datasets to test the implemented system. Used datasets are recorded for the purpose of testing the abnormal behavior (kicking, pushing, punching).

In fig.1 (a&b), frame shows the normal behavior of the pedestrian. Frame rate depends on the quality of the video sequence. Standard frame rate is 60 frames per sec.



Fig. 1(a)



Fig.1(b)

Fig. 1 Normal behavior

In fig. 2 frame shows the abnormal behavior of the pedestrian and after detecting abnormal activity system

triggers the alarm with message “Abnormal activity detected”.



Frame 45



Frame 49



Frame 58



Frame 41

To count the multiple moving objects, face detection algorithm is used so that duplications can be avoided and we get the correct count.



Frame 69

## 6. CONCLUSIONS

We propose a technology that robustly detect and track movable objects and we are using automated system to detect abnormal events. So, there is no need to continuously monitor surveillance area. Security officers get alert by automatic alarm system. We get the count of humans from the multiple moving objects.

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