



# Suspicious human activity detection

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## ABSTRACT

*Human activity detection for video surveillance system is an automated way of processing video sequences and making an intelligent decision about the actions in the video. It is one of the growing areas of Computer vision and artificial intelligence. Suspicious Human Activity Detection is the process of detecting unwanted human activities in a crowded place and alerting the concerned authority about the activity. This is done by converting video into frames and analyzing the persons and their activities from the processed frames. This paper gives an overall idea of the development of the system that detects suspicious human activities.*

**Keywords:** Video Analytics, Preprocessing, Background elimination, Face detection, Person recognition.

## 1. INTRODUCTION

Detecting suspicious activity in crowded places is very important as it can help us in preventing many of the criminal activities. This can be by using video analytics. Video analytics can be used in person identification, activity recognition, counting objects and people, etc. Suspicious activities are the unwanted activities performed by humans in certain places. Example for such activity includes talking in exam hall, sleeping in classrooms, etc. Such unwanted activities can be detected by analyzing the hand gestures, head movement of the person. This paper talks about the detection of the suspicious activities by analyzing the frames from the video input. First of all, the video has to be converted into frames and stored. These frames must be preprocessed to remove the noise in the frames. After preprocessing, the area of interest has to be subtracted from its background. This can be done by detecting the edges of the objects of interest and subtracting it from the background. After background elimination the image must be post processed to remove the noises in it. After noise removal the activity the algorithm for face detection has to be used to detect the faces in the image. Then, the persons in the image have to be identified. Once the persons are identified the activity done by them must be identified. This can be done by matching the pattern with the database. If the activity done by the person is found to be suspicious, the concerned higher officials must be alerted and the details of the persons involved in the activity must be sent to them.

## 2. LITERATURE SURVEY

Traditionally, the suspicious activities were monitored by human itself. This was done by appointing people in crowded public places to continuously monitor the activities of the people there and detect any suspicious activities. This method was a failure because it is very difficult for human beings to be attentive for more than 20 minutes or so. Thus people started using machines and algorithms to replace humans in the process of monitoring crowded places. Video analytics is the field that is widely used now in detecting the human activities.

Video Analytics [1], also referred to as Video Content Analysis (VCA), is a generic term used to describe computerized processing and analysis of video streams. Before detecting the human activities from a video input, it is important to detect the objects present in the video. The object detection can be done by frame difference, background elimination and background registration techniques [2]. Post processing techniques are used to increase the clarity of the frame obtained. The noises in the frames can be removed by using the Gaussian filter approach [3]. Background subtraction and histogram of gradients technique [4] is used for detecting the presence or absence of a human. The detection of human motion can be done by several other methods. One such method is the motion estimation map [5]. It is used to estimate the motion of humans in a surveillance video. The huge advantage of this method is the ability of it to identify motion in daylight as well as night time. Adaptive Background modeling [6] is another method which is used to detect humans in a crowded environment. The faces of the persons in the processed frame have to be identified. This can be done by using the Haar features approach [7][8] or the Surf features approach [9].

### 3. PROPOSED SYSTEM

#### A. Training Data Set

The training data set consists of photos of different people taken in different angle. Each person's images are stored in separate folders. The values generated from the images are stored in the database along with the details of the student. This value can later be used to compare the data obtained from the video frame to identify the person involved in the activity. A database is created to store the student's details. One table stores the details of the student and their tutors. The other database contains the list of suspicious and unsuspecting activities along with their respective values.

#### B. Frame Extraction

The first process is to convert the video into frames. Initially, the video is captured by using the VideoCapture class. The frames are read one by one and are stored in a folder. A Boolean variable is used to check the presence of the next frame. If a next frame is present, it is set to 'True' else it is set to 'False'. Until the value of the Boolean variable becomes false, a loop is run to collect all the frames and store them in the folder.



Fig 1: Frame extracted from the CCTV footage

#### C. Frame Preprocessing

The first step in preprocessing the frames includes the conversion of the image into grayscale image. The conversion of color image to a grayscale image is done by using the cv2.cvtColor() method. The resultant image is stored as the grayscale image of the original image.

The frames can be preprocessed to remove noise using Gaussian blur, Gabor filter and Gaussian filter techniques. The method that we are using to remove noise from the image is Gaussian Blur. It is a method that is derived from the Gaussian function. It helps in remove noises from the image and reduces the details in the image.



Fig 2: Grayscale image

#### D. Canny Edge Detection

The algorithm we are using for detecting the edges is the Canny edge detection algorithm. Canny edge detection algorithm is a multistage algorithm. That is it has few implicit functions. Gaussian blur is the implicit feature in Canny edge detection algorithm. Thus by calling Canny() method, we will be able to blur the image, eliminate the noises and detect the edges in the image.

The syntax for Canny edge detection is given by:

```
Canny(image,threshold1,threshold2);
```

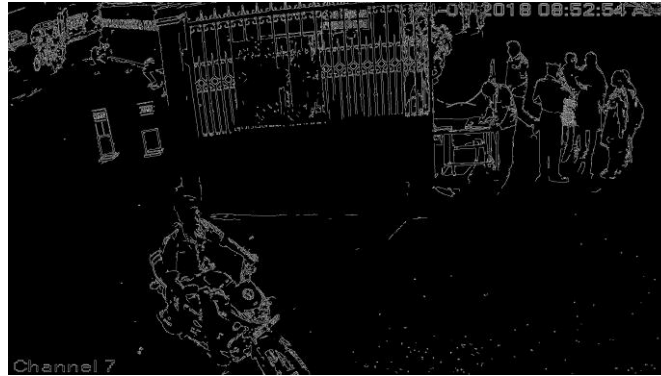
Where,

Image: Image whose edges are to be detected

Threshold1: Minimum threshold value

Threshold 2: Maximum threshold value

The intensity gradient is calculated and is compared with the threshold specified. If the intensity gradient is found to be greater than the maximum threshold, then the pixel is definitely an edge pixel. If the intensity gradient is found to be lesser than the minimum threshold, then the pixel is definitely a non-edge pixel. If the intensity gradient lies within the between the minimum threshold and the maximum threshold, then it is checked if there is any connection between that pixel and the edge pixel. If a connection exists, then the pixel is selected as an edge pixel else it is discarded. Thus the correct edge of the image can be obtained.



**Fig 3: Edge segmented image using Canny Edge Detection Algorithm**

#### **E. Surf features approach**

After obtaining the foreground the Surf feature approach is used to detect the faces in the image. In computer vision, speeded up robust features (SURF) is a patented local feature detector and descriptor. It can be used for tasks such as object recognition, image registration, classification or 3D reconstruction. It is partly inspired by the scale-invariant feature transform (SIFT) descriptor. The standard version of SURF is several times faster than SIFT and claimed by its authors to be more robust against different image transformations than SIFT. After training, this algorithm can be used to compare image.

#### **F. Further points**

The output obtained is compared with the data in the database and the persons in the image are identified. Next the activity of the person is identified and the activity is checked to see if it is suspicious or unsuspecting activity. This is done by comparing the detected activity with the set of suspicious activities in the database. If the activity is found to be suspicious the details of the persons involving in the activity are sent to the concerned higher official and an alert message is sent to them.

#### **4. CONCLUSION**

Thus the Suspicious Human Activities can be detected using this system. Further, this system can be extended to detect and understand the activities of people in various scenarios. This system is currently developed for detecting the activities of people in a stationary background. This system can be further extended to detect human activities in places with mobile background.

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