



# Unusual Event Detection for Enhancing ATM Security

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**Abstract** In real life applications, identification of unusual events in low resolution video is a challenging task because of fact that there is loss of discriminative detail in the visual appearance of moving object. The current techniques are generally based on the upgrade of LR (low resolution) video by super resolution technique. These strategies require high computational expense. We present a design which can recognize unusual event such as weapon, face covered with helmet or multiple person detection without such kind of transformation and appropriate for upgrade of safety of ATMs where conventional low-resolution cameras are generally used due to their low fee/cost.

In proposed system we have used two techniques to detect the motion and image of particular object. Open CV algorithm is used for motion and Haar cascade is used for image recognition. These techniques have high accuracy and speed of operation. It has been analysed with the help of raspberry pi. This proposed method is applied to enhance the ATM security. Algorithm utilizes rolling average background subtraction method to identify foreground object from dynamic background in a scene. Our proposed system can observe the occurrence of unusual events in low-resolution video simply by using statistical property, standard deviation of moving objects and also send alert message to the authorized person.

**Keywords:** Object Tracking, Unusual event, Background subtraction, ATM security.

## I. INTRODUCTION

ATM allows the client to deal with the bank customer to handle without the requirement for a human teller. Utilizing ATM card, customers can withdraw cash from existing or savings accounts, make deposits or transfer the cash starting with one record then onto the next or execute different tasks. In most of endeavours of attacks, the aggressor/attacker has prevailing in various degrees. To shield from this kind of tricks some wellbeing highlights have been added/created for ATM's from sometimes yet the wrongdoers keep these security measures in charge.

Inside an ATM there are various assaults, since they are an enticing decision. ATM assaults come in three basic sorts:

1. Physical Attack.
2. Attack with weapons.
3. Person entering ATM wearing masks/helmet.

In the previous few decades, huge efforts in the field of moving object recognition and tracking have been done to make following applications reliable, robust and effective: video surveillance, authentication framework, media creation, alert system and so forth. There are numerous difficulties which produce obstacles in the improvement of these applications. These difficulties may incorporate illumination change, dynamic background, processing time, shadow and so on. These hindrances become more troublesome when we perform object detection in low resolution video.

The majority of the conventional tracking follows the methodologies depending on the high resolution (HR) video to extract definite form [4] and shape [5] features of goal. However, these methodologies require more computational expense since they work on high-resolution frames. A few methodologies in the literature utilize low resolution video as an info however a short time later these recordings are upgraded to high resolution with the assistance of any super resolution techniques, which proves to be not cost producing.

In the literature of abnormal event detection, the majority of the techniques as in [6], [7] and [8] utilizes classifiers to perceive the events and doesn't utilize low resolution video technique. These classifiers require learning time and cautious consideration on preparing dataset. A few methodologies as in [9] require manual arrangement at first in automated event identification framework and have high computational expense. From the literature we come to the way that we need an algorithm which manages unusual event detection in low resolution video to assist completely robotized/automated surveillance system.

## II. PROBLEM STATEMENT

Is it plausible to vigorously and consequently recognize unusual events in video observation and progressively detect the events in video surveillance in real-time where the abnormal events are speed, direction and out-of-place objects? This project is targeting at detecting unusual events from surveillance videos. All of the recordings are shot utilizing a solitary static camera. One example of such an event could be detection of events where a person using knife inside ATM.

## III. OBJECTIVE

- Person who enters into the ATM face is detected by face recognition features.
- If his/her face is covered by helmet or mask (leaving the pandemic situations) while using ATM which will make it difficult to identify his face then it will be treated as unusual.
- The person is inside ATM without initiating any activity for certain amount of time i.e. above the threshold time then an alarm message for the Security guard is issued to monitor his movements on screen.
- If multiple face is detected then it is considered as Unusual Activity. This is done to avoid theft inside the ATM room.
- If Person carries any unusual things like Gun, Hammer or Knife then it's considered unusual activity.

## IV. VIDEO SURVEILLANCE WORKING PROCESS

In recent years, the video surveillance system has been a vital research area in monitoring humans and their behaviours to analyse unlawful activities. This system can be applied in various areas such as security systems, banks, traffic monitoring on highway, airport terminal checking and robotics.

In general, any object tracking system includes four main building blocks to systematize the observation structure they are:

- Object detection
- Object tracking
- Event recognition
- Object identification

A. **Object Detection:** The change in detection of image sequence is gaining popularity due to large number of applications in several disciplines. Video surveillance is one of the important applications among them that detect changes in the scene. There are several schemes that are used to detect such changes. These tactics are categorized in two conformist classes:

- Temporal differencing
- Background modelling and subtraction

First method is the simplest one and has low computational cost but performance is quite poor in the real-life applications. While the Background subtraction is verified to be most successful, used in both dynamic and static background for effective detection of the foreground object.

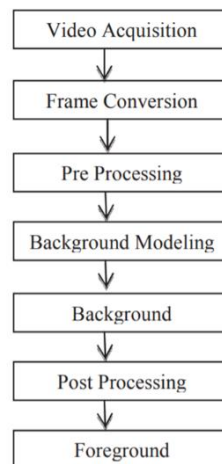


Fig 1: shows an overview of the background modelling and subtraction system.



1) **Video Acquisition:** This step deals with capturing the video by any one of the video apprehending devices such as Handy cam, Mobile camera, USB camera, CCTV camera etc.

2) **Frame conversion:** After capturing the video, it is transformed into frames of suitable type so that further processing could be done conveniently.

3) **Pre-processing:** Some pre-processing is practical on the edges of the video to reduce noise. There are some common methods of pre-processing they are: Smooth, Dilate, Erode, Median, Open, Close etc.

4) **Background Modelling:** After pre-processing background modelling is used to create an ideal background (static or dynamic) according to environmental changes. This is an important step of the system that sometime may include image subtraction operations. It is defining characteristics of any background subtraction system and it uses the techniques which are categorized as recursive and non-recursive.

5) **Background Subtraction:** This is the key step. In this step any significant changes in the image region from background model are identified and then pixels constituting the regions undergoing change are marked for further handing out. Usually connected component labelling algorithm is applied to obtain connected regions corresponding to the object.

6) **Post processing:** Lastly, post processing is done to improve the results. There are many post processing techniques that can be used after background modelling and subtraction. These techniques have an objective to progress in foreground mask.

7) **Foreground extraction:** This is the final step in the process which abstracts the moving object from the frame. The result of this step helps in the decision of the efficiency of the background subtraction system.

### B. Object Tracking:

Finding correct tracking information of moving foreground object is a difficult task in events like motion recognition and modelling. Object tracking take the task of detecting the object, after the detection of object sends a alert message or mail to the authorized person. It tracks the each of the object as they move around frames in a video. For this purpose, many diverse types of algorithms have been used. These algorithms are divided into four different groups. They are Contour based, Model based, Feature based, Region based.

### C. Event Recognition:

Event recognition is the definitive purpose of an abundantly automated surveillance system. It is not an easy task to define the type of motion that is meaningful in video surveillance system. In event recognition the objects are detected by using background subtraction and then their boundaries are extracted to produce a skeleton. This skeleton structure provides important motion signals such as body posture etc. Movements of segmented spots helps in event recognition and detection such as fight or theft, running and overcrowding etc.

### D. Object Identification:

Accepting the identification of “who is now entering the area under surveillance” is of increasing importance for video surveillance. Latest studies focus on personal identification and are based on biometrics such as Face and pace. Human pace and face are now regarded as the main biometric features that can be used for person identification in video surveillance systems. An example for human face and pace is shown as below.

Fig.2a Face Recognition



Fig.2b Human Pace



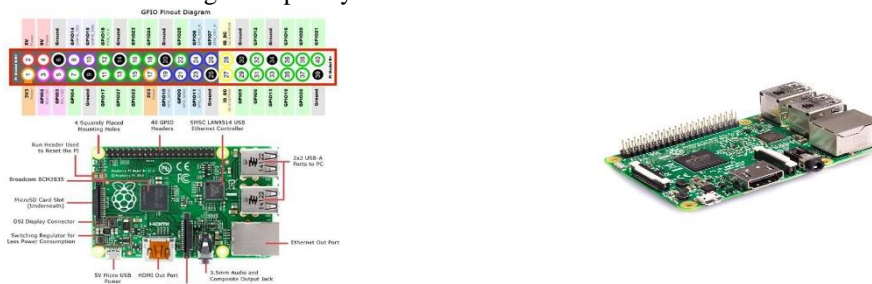
## V. WORKING PROCESS

- A web camera is set up in the desired location. It captures pictures and videos. The real time video/image is taken as input from the camera.
- When a person enters into ATM for transacting then he/she can finish their process and leave. If any robbery, threatening, crowd or weapons are detected then, ATM door is closed. Here we have used the DC motor for closing door mechanism.

- The images are taken as input, then required features are extracted and classified as above-mentioned in the video surveillance process it takes place.
- Any of the abnormal event occurring inside the ATM is detected using pi camera, Raspberry Pi will signalize automatically to close the door and there will be a buzzer for cautioning.
- At the same time the message is sent to the authorized person and also the images captured are sent through mail.

## VI. HARDWARE COMPONENT

Fig.3 Raspberry PI Board



### 1) RASPBERRY PI 3 Model B

The Raspberry Pi 3 Model B has a processing capacity which is 10x times than the first-generation models. This third-generation Raspberry Pi has a Broadcom BCM2387 processor, which is a powerful ARM Cortex-A53 based quad-core processor that runs at 1.2GHz. The board also promote a memory capacity of 1Gbyte. The total specifications of raspberry are mentioned below.

Raspberry Pi has an Broadcom BCM2387 System on Chip. The main architecture of Raspberry pi is a Quad-core ARM Cortex-A53. Linux operating system is used in Raspberry Pi that boots from Micro SD card. It has 10/100 Base T Ethernet socket connector. It supports a HDMI video output and 3.5mm audio output jack and it has 4xUSB 2.0 connector and also 40 GPIO pins.

### 2) PI CAMERA

It attaches to the Raspberry Pi via one of the small sockets on the board's upper surface and designed especially for interfacing to cameras. Connects to the Raspberry Pi board via a short ribbon cable. 5-8megapixel native resolution. Camera v2 is supported in the latest version of Raspberry Pi's preferred operating system and has a frame rate of 30 frames per second.

### 3) SD CARD

We are using 32GB SD Card which works like hard disk where we install the operating system and run it, to write and execute the codes in the platform and install the packages required to run the code.

### 4) DC MOTOR

DC Motor is used for initiating the door closing mechanism.

## VII. RESULTS

A. The project setup is shown in figure 4a,4b.

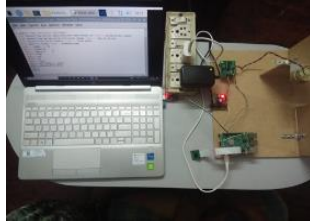


Fig.4a



Fig,4b

B. The alert message sent to authorized person can be seen in figure 5a,5b.

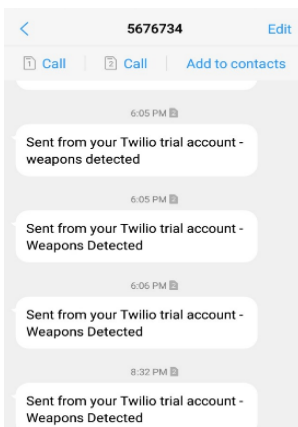


Fig.5a

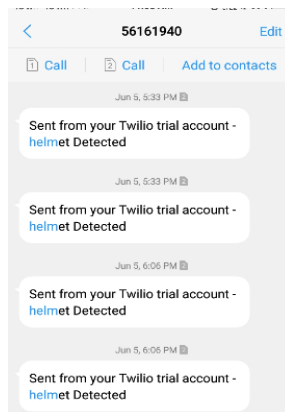
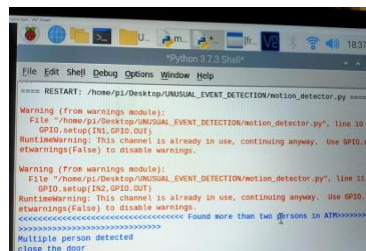


Fig.5b

C. The system output after unusual detection can be seen in figure 6a,6b,6c.



Fig,6a

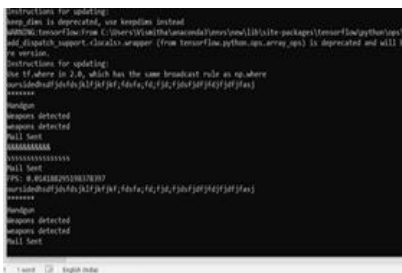


Fig.6b



Fig.6c

D. The images sent to authorized person through mail can be seen in figure 7a,7b.

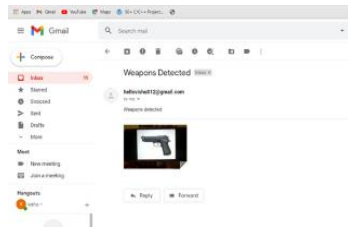


Fig.7a

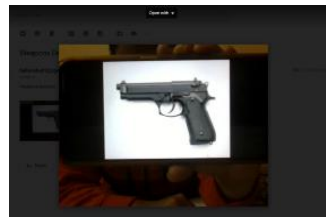


Fig.7b

## VII. CONCLUSION

The proposed system will provide much security to the ATM. If any abnormal event occurs in the ATM, automatically buzzer sound will be generated and ATM door will be closed. The unauthorized person cannot escape easily from the ATM. This is the main advantage in the proposed system, as soon as if any unusual event happens inside, the police and bank officials will come to know easily with the help of alert messages through e-mail and SMS. Further implementing more weapon detection to identify, using metal sensors and also full body scanner can help in reducing threats and will give a high security system to ATM.

## VIII. ACKNOWLEDGEMENT

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