

# Unusual Event Detection for Enhancing ATM Security

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**Abstract:** Now-a-day's providing security to the ATM Machine is the most challenging task for banks. The existing methods are difficulty to identify each bizarre situation occurs in the ATM Machine. The existing CCTV system will identify any abnormal event through video clips and it will not send any alert messages to the concerned bank offices and police department's officials. The proposed method will provide much security to ATM machine and it is easy to detect the unusual event using modern technologies like Internet of things (IoT) and Machine Learning (ML). If any unusual event happens, automatically ATM door will be closed and unauthorized person cannot escape from the ATM premises. The system also sends alert messages to bank and police officials through E-Mail and SMS. The CNN algorithm is used for weapon detection and Haar Cascade algorithm used for face recognition.

**Keywords:** Accelerometer, Arduino Uno, ATM, CNN, DC-Motor, H-Bridge, Haar cascade, LCD display, Power supply, Vibration sensor.

## 1. Introduction

An Automated Teller Machine (ATM) provides various banking services to customers. customer can deposit and withdraw the amount.

Now a day's providing security to the ATM Machine is the most challenging task for the banks. There are many technologies are available, but still difficulty to provide security to the ATM. If any unusual event happens in the ATM, it is very difficult to identify the unauthorized person. If any abnormal event occurs in the ATM, police and bank officials will not come to know immediately. The proposed system will address these issues.

Types of attacks on ATM:

These are the most widely recognized attacks on ATM such as:

- Physical Attack
- ATM Fraud
- Software and Network Attack

1) Physical attack: Physical damage of ATM machine by the

culprits.

2) ATM Fraud: Unauthorized person's transaction.

3) Software and network attack: Hacking of others accounts for ATM transaction by unauthorized person.

## 2. Literature Survey

In [1], Techniques where used are able to detect the existences of unusual event like face masking, camera masking, fight or overcrowding in the low resolution video merely by means of standard deviation, statistical method of moving target objects. Even it processes low resolution frames and also sends alert messages to the concerned authorities in investigation system for enhancing the ATMs security and prevention of thefts using conventional camera of low resolution. This work had been implemented in MATLAB. In this system it will not send the capture unusual event images to the concerned authorities. In [2], The algorithms are used in this systems are Rolling Background Subtraction Technique, Close Morphological operation, thresholding and standard deviation. Proposed approach will detect unusual event and the system does not send the alert messages to concerned authorities.

## 3. Problem Statement

Computerized teller machines are cash container terminals allowing the customers to legitimately get the cash, even in the absence of security personnel. There may be few criminals' physically assault on Automated teller machines forcibly and even they do some transactions. To protect from these issues, the Automated teller machine will be equipped with security system.

### A. Existing system

The existing methods are difficulty to identify each bizarre situation occurs in the ATM Machine. The existing CCTV system will identify any abnormal event through video clips and it will not send any alert messages to the concerned bank offices

Table 1  
Details of money lost (in rupees) by ATM attacks

	2014-2015	2015-2016	2016-2017	2017-2018	Total
Karnataka	Rs. 6.40 cr	Rs. 4.06 cr	Rs. 9.88cr	Rs. 7.96 cr	Rs. 28.1 cr
All-India	Rs. 51.72 cr	Rs. 40.10 cr	Rs. 65.30 cr	Rs. 18.48 cr	Rs. 175.60 cr

and police department’s officials.

Limitation of existing system:

- CCTV just store the information.
- Alert messages will not be sent to the concerned peoples.

**B. Proposed system**

The proposed system will provide much security to the ATM machine than the existing system. Camera captures each and every movement of the person in the ATM and those events will be store as video clips information and it will be helpful to identify the unusual event. The proposed architecture contains hardware components like Arduino Uno board, Accelerometer, vibration sensor, LCD Display, DC motor, H-Bridge and Power supply. These components are connected through cable to PC/Laptop. The Arduino Uno is a controller and it helps to control other components. The 16x2 Character LCD Display, which is used for displaying the message. The DC-Motor will helps to close or open the ATM machine. If any unusual event occurs, automatically ATM door will be closed with the help of the DC-Motor. The H-Bridge will control the direction of motor such as forward (closing door) or backward (opening door). The Vibration Sensor will vibrate the ATM Machine, if any unusual event occurs. The Accelerometer is used to find the weather the ATM machine is tilt or not. The Power supply will provide power to the hardware components. If any unusual event occurs in the ATM, automatically buzzer sound will be generated and ATM door will be closed. Each event will be captured from the live video and converted into image. The unusual events images will be sent to the particular area police station officials through E-Mail and also alert messages will be sent to particular bank officials through SMS. This is the main advantage in the proposed system as soon as if any unusual event happens in the ATM, the police will be come to know easily with the help of the E- mail and unauthorized person cannot escape easily from the ATM. The ATM door will be closed if this kind of unusual event happens such as Helmet detection, More than 2 people’s detection, Weapons detection and Mask detection.

*Advantages of proposed system:*

- Easy to identify the multiple unusual event.
- Any unusual event will be informed to bank and police officials.

**4. System Architecture**

The Camera identifies the multiple person’s detection automatically and stored this information in PC/laptop. This information will be passed to the Arduino board. If any unusual event happens in the ATM, automatically DC Motor will be activated and ATM Door will be closed. If the ATM machine direction is changes, automatically accelerometer direction also changes. Once this unusual event happens, automatically ATM door will be closed. If any of the person tries to break the ATM machine, automatically the vibration sensors get activated and control will be passed to the DC motor. Then DC motor will be activated and ATM door will be closed. All these events are

displayed on LCD display and alert message will send to the nearest police station and bank officials. The ARDUINO is a controller and it helps to control other components. The Accelerometer is used to detect whether the machine is tilt or not. The Power supply will provide power to the hardware components. The H-Bridge will control the direction of motor such as forward (closing door) or backward (opening door).

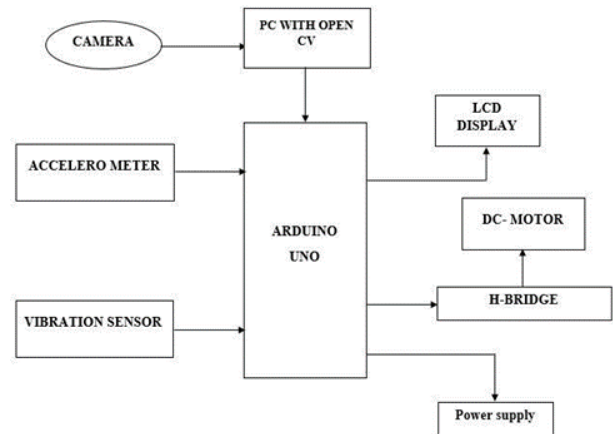


Fig. 1. System architecture

**5. Flowchart**

If camera identifies unusual event ATM door will lock and buzzer will ON, sending E-Mail to the nearest police station and message to the particular branch office.

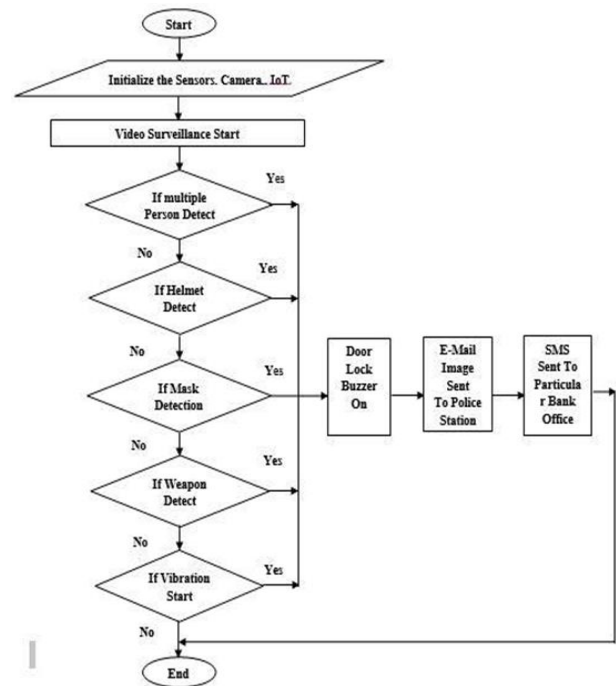


Fig. 2. Flowchart

**6. Methodologies**

The Pseudocode 1 is used for Face Mask detection and

Multiple Face recognition using Haar Cascade algorithm. It will work with face zone. For face detection, each Edge Feature, Line Feature and Four-rectangle features are used to detect the faces.

<p>Pseudocode 1: Face mask detection and multiple face recognition.</p> <p>Input: Face Mask Images; More than two Face Images.</p> <p>Output: Detection of Face mask and identified as unusual event.</p> <p>Step 1: Input face mask images and multiple face images.</p> <p>Step 2: Process the images.</p> <p>Step 3: Converting RGB images to gray scale image.</p> <p>Step 4: Gray scale image is masked or unmasked image.</p> <p>Step 5: Detection of Single person /multiple person face mask images by Haar cascade method for unusual event.</p>
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<p>Pseudocode 2: Object Detection</p> <p>Input: Object Images.</p> <p>Output: Detection of Objects</p> <p>Step 1: Input object Images.</p> <p>Step 2: Process the images.</p> <p>Step 3: Converting RGB images to gray scale image.</p> <p>Step 4: Gray scale image is object or not.</p> <p>Step 5: Detection of object images by using CNN method for unusual event.</p>
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The Pseudocode 2 is used for Multiple Object detection using Convolution Neural Network Algorithm. The proposed CNN model uses 2 hidden layers first layer for RGB image and second later used for conversion of Gray scale image. The model uses Output layer for object detection.

### 7. Results and Discussions

#### Hardware Requirements

- Microcontroller – ARDUINO
- H-Bridge
- LCD - 16 x 2
- Vibration Sensor
- Accelerometer
- DC Motor
- Power Supply

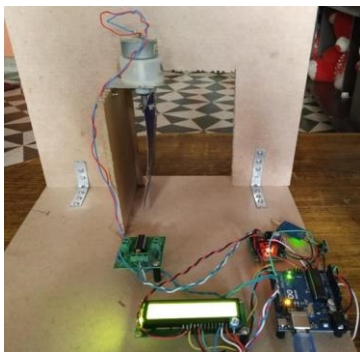


Fig. 3. Hardware model



Fig. 4. LCD display



Fig. 5. LCD Display (Alert Message)



Fig. 6. Hand gun detection

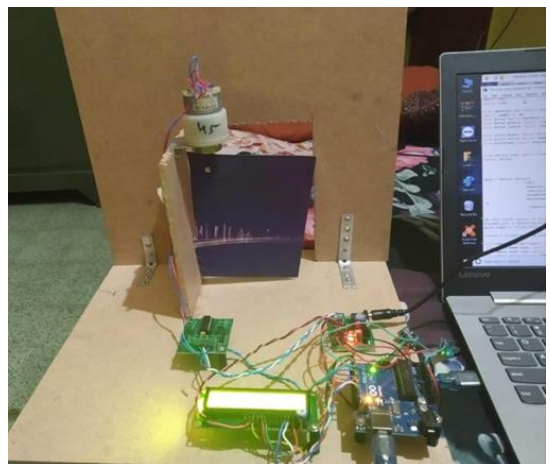


Fig. 7. ATM door closed

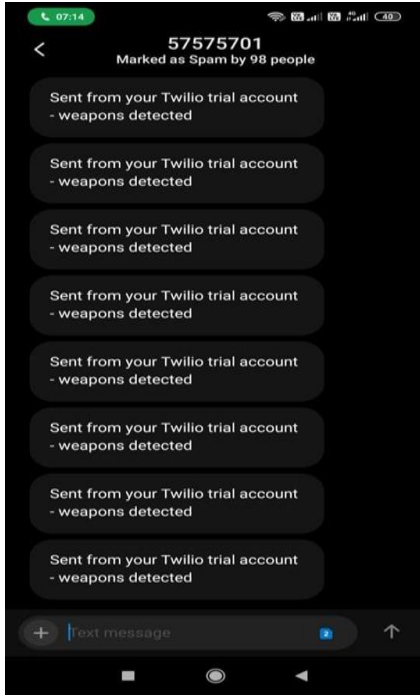


Fig. 8. Sending MSG to the Particular ATM branch office (Hand Gun Detection)

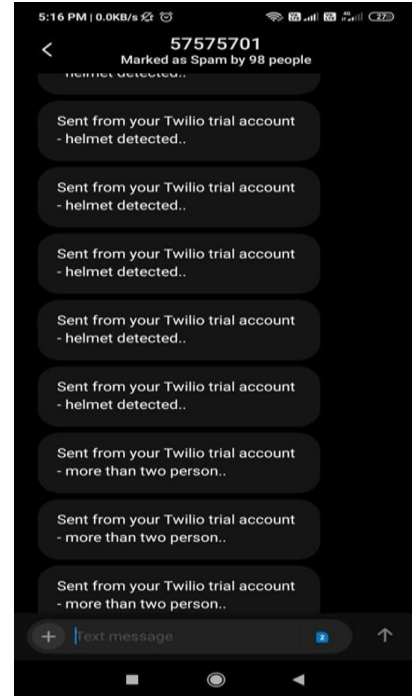


Fig. 11. Sending MSG to the Particular ATM branch office (More Than 2 Person Detection)

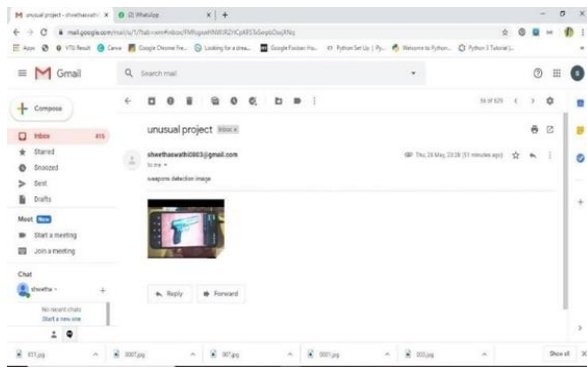


Fig. 9. Sending E-Mail to the Particular Police Station (Hand Gun Detection)

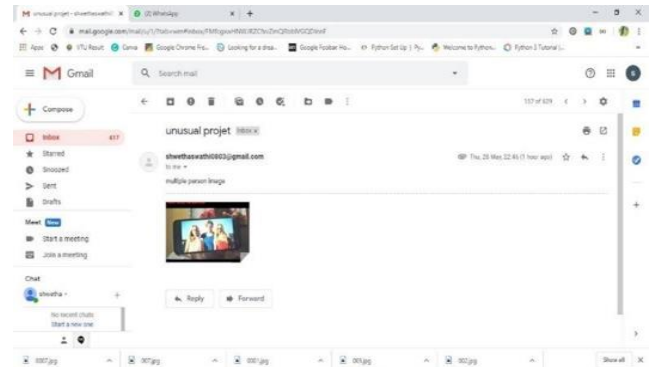


Fig. 12. Sending E-Mail to the Particular Police Station (Hand Gun Detection)

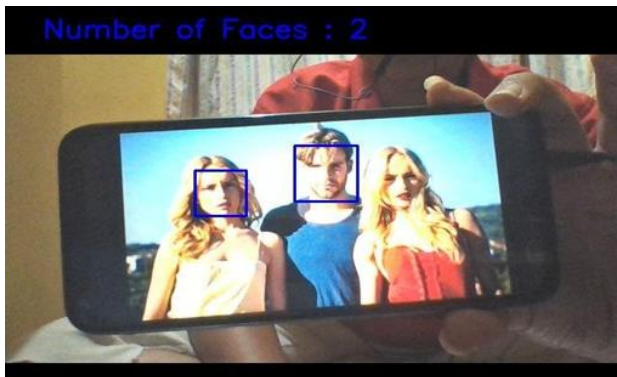


Fig. 10. More than 2-person detection

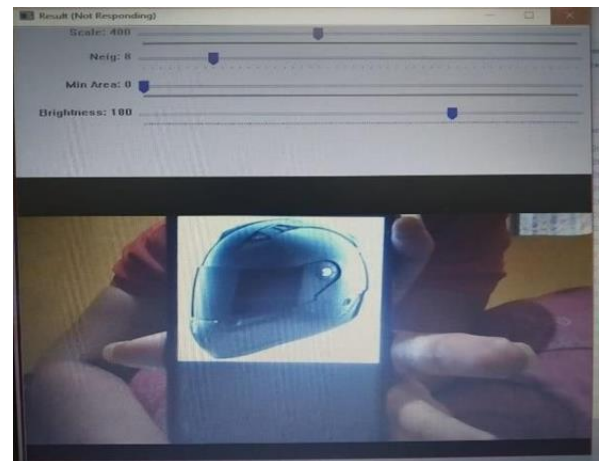


Fig. 13. Helmet detection

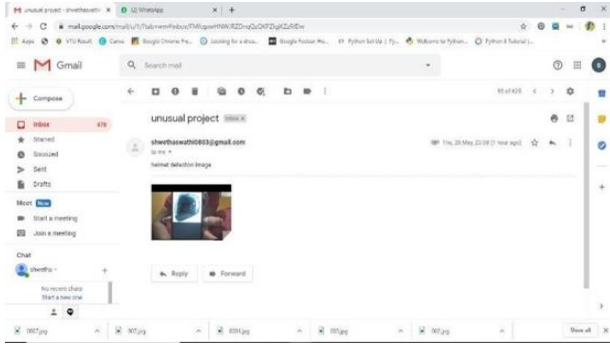


Fig. 14. Sending E-Mail to the particular Police Station (Helmet Detection)

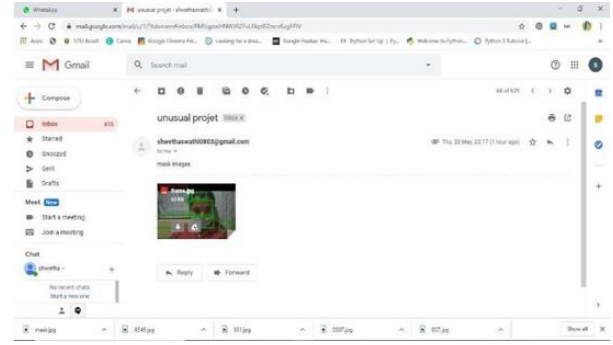


Fig. 17. Sending E-Mail to the Particular Police Station (Mask Detection)

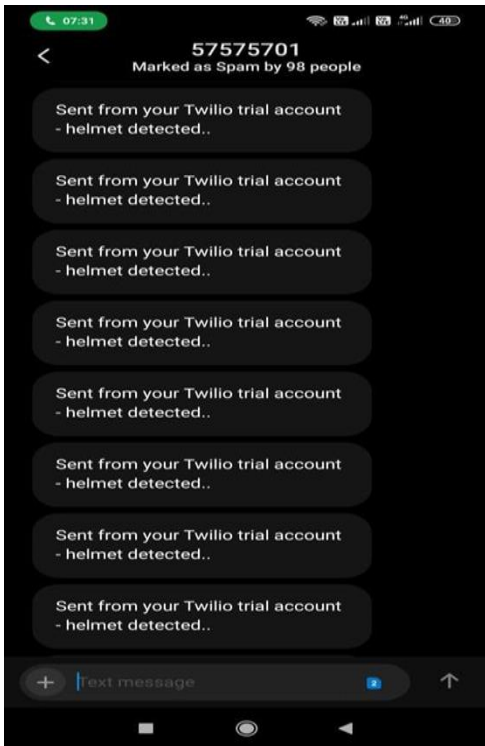


Fig. 15. Sending MSG to the Particular ATM branch office (Helmet Detection)

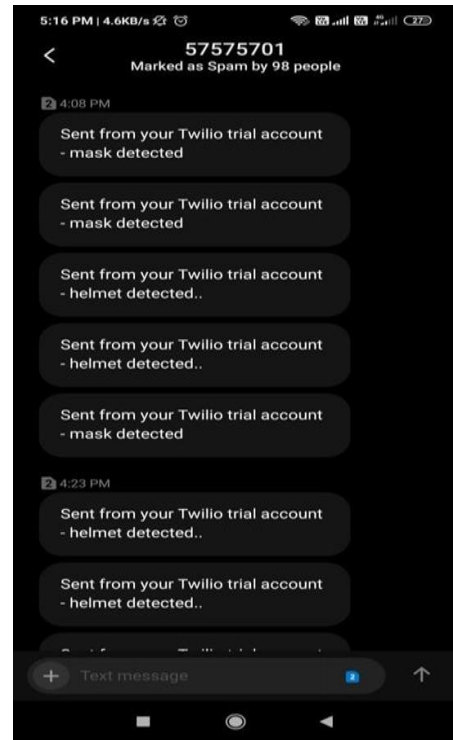


Fig. 18. Sending MSG to the Particular ATM branch office (Mask Detection)

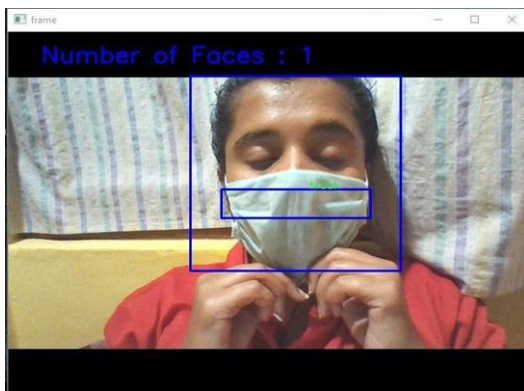


Fig. 16. Mask detection

### 8. Conclusion

The proposed system will provide much security to the ATM machine. If any abnormal event occur 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 in the ATM, the police and bank officials will come to know easily with the help of sending alert messages through E-mail and SMS.

### 9. Future Enhancements

- Implementing more weapon detection to identify.
- Keeping metal sensor to the ATM door, so it will avoid abnormal event and no need any kind of security guards.

### **References**

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