



# Advanced Anti-Theft ATM Security using Raspberry Pi

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## ABSTRACT

Automated Teller Machines ATMs are used for different ways, mostly cash withdrawals. ATM users utilize many services on ATM and they will do some billions of transactions. Meanwhile robberies occurring in the ATMs are also high with the lack of security. The main objective of our study is to minimize the robberies occurring in the ATM's. For that we have to implement a low cost standalone Embedded Web Server based on ARM11 processor and Linux operating system using Raspberry Pi. This setup is proposed for ATM security, comprising of the modules namely Door lock, web access Wi-Fi, GSM Modem, sensors and camera. Whenever robbery occurs, Vibration sensor is used here which senses vibration and buzzer produced sound alert from ATM machine and takes necessary action. Once the vibration is sensed, information is passed to ARM11 based master device. Then the DC Motor is used to close the door of ATM, a relay will be triggered to leak the gas inside the ATM to bring the thief into unconscious stage, Camera is always in processing and it sends the images to web server and also it will be saved in computer, GSM Modem sends messages to nearby police station and corresponding bank authorities and finally an alarm sound will occurs from buzzer. This will prevent the robberies, and the person involving in the robbery can be easily carriedout.

**Key Words:** Automated Teller Machines (ATM) Security, Unauthorized Access, Internet of Things (IoT), Alarm System, Raspberry Pi, Linux OS, Theft Controlling and etc.

## 1. INTRODUCTION

The Idea of Designing and Implementation of Security Based ATM theft project is born with the observation in our real life incidents happening around us. This project deals with prevention of ATM theft from robberies overcome the drawback found in existing technology in our society.



Figure 1: Smart ATM Solutions.

Whenever robbery occurs, Vibration sensor is used here which senses vibration produced from ATM machine. This system uses Arduino controller based embedded system to process real time data collected using the

vibration sensor. Once the vibration is sensed, information is passed to ARM11 based master device over zigbee channel where alarm sound starts from the buzzer. DC Motor is used for closing the door of ATM. A relay will be triggered to leak the gas inside the ATM to bring the thief into unconscious stage. Camera is always in processing and sending video continuous to the PC and it will be saved in computer. RTC used to capture the robbery occur time and send the robbery occur time with the message to the nearby police station and corresponding bank through the GSM. This will prevent the robbery and the person involving in robbery can be easily carried. A wireless telephone system that helps clients to carry out financial transactions, in particular cash withdrawals. 3 million bank branches are set up worldwide as per ATM Industry improvement. Through inserting a reversible Debit card or a mobile application with such a chip card that requires a special key, ATMs are remembered. With less safety data, such as CVVC, it is of wide variety. Authentication is issued by entering the Personal Identifying Number (PIN) of the client. Meanwhile, ATM thefts are still on the rise in society. Due to the lack of security on the ATM mounted equipment, the target of the ATM robbery is. Although guards are available at ATMs, with the aid of some tactical methods, criminals manage to carry out the burglary. As a consequence, GOVT has a few lakhs and cashcrores.

## 2. LITERATURE REVIEW

There are so many authors that they have been used different methodologies in the past may be summarized as follows:

[1] KanchanP.Boradeetal. (march2017) demonstrated how Using GSM technology, vibrating sensor, dc motor, Web camera, buzzer with Raspberry pi 2 can be implemented in ATM Machines centre to automate ATM THEFT prevention from robbery thief. By implementing this project we can catch thief and robberies in ATM itself and we can also save our precioustime.

[2] K. Hemasaisivaprasad et al.(2016) has The proposed framework guarantees the creation of an innovative anti-theft ATM system. In this project, a sophisticated and cost- effective solution was suggested for Mobile payment safety. It can be put in the ATM at a

hidden location so that the thieves are unable to access it. The proposed solution differs from existing ATM intrusion and theft control devices in many respects; the systems currently in use are just very expensive and inefficient from either a distance. Reliable construction, affordable and appropriate.

[3] Karen Renaud(ELSEVIER, 2017) et al. A textual-review of the HCSP analysis has been published. Using the waves proposed by Bødkerand Harrisonet al., we found them field aturity. We showed why the major conference journals from the HCSP seemed to show that we would be now also going to work on first surge. A glance at a few of the IT gatherings shows that papers from the third and fourth waves were starting to appear. We have offered several ideas and proposals for a way forward before ensure that our business is mature and to improve the security of personalcomputers.

[4] G. Jakeer Hussain et al(Aug 2016) has proposed a system by developing integrated features of all software and hardware components which are designed and used successfully by testing them. In this system he has used a MEMs sensor by placing it in the locker section of ATM. When a user is trying to open the money locker mems sensor is activated and the door gets closed automatically and the data is stored in the embeddedsever.

[5] Taha Ayesha et al (2018) implemented a system to secure the ATM transaction using Raspberry pi interfaced with GSM, RFID module, keypad, monitor, USB camera based on embedded linux platform. Consecutive acts, such as ATM, are given for the security function. user to swipe the card with person's captured image and SMS alert is sent to the card holder using raspberry pi processor and GSMmodule.

[6] D.Narmada et al. (Aug 2016) has Proposed an innovative security system has adopted. It can be linked to certain secret places in the ATM that can not be reached by robbers. In several respects, this gadget is different from the existing ATM intrusion and fraud management structures. Current networks are both expensive and not much reliable. The system deployed is efficient, cheaper and of an acceptablenature.

### 3. PROPOSED METHODOLOGY

In this project we analyzed what is the problem people faced in the existing technology. Especially Multifactor Authentication (MFA) method provides more complexity to the user. This project helps to overcome the problem of complexity and provides easiest way to secure the ATM transaction. Whenever person enters account number onto the ATM machine, the system requires PIN to authenticate the user. If PIN gets verified, it makes a call to the user's mobile. If the user replied to make a transaction, then transaction process takes place. The proposed system uses GSM modem for call from ATM to the user and getting reply from user to ATM. If user correctly entered amount and secondary password from mobile then transaction takes place. There is no any problem of lost or damaged ATM card. Also if the robbers try to damage ATM machine then the vibrations are detected by vibration sensor and give an alert message to the nearest police station and switches on the alarm.

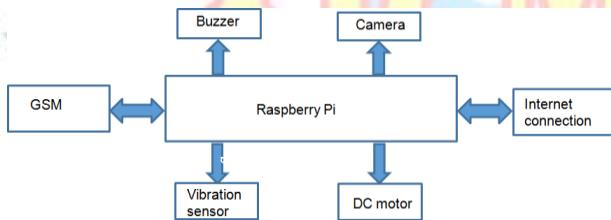


Figure 2: Proposed Method Block Diagram.

### 4. METHODOLOGY AND WORKINGPROCESS

**RASPBERRY PI:** In particular, A Raspberry Pi 3 Display B operated with the Broadcom BCM2837 System-On Chip (SoC), which has four excellent 1.2 GHz ARM Cortex-A53 process cores with 32 Kb Level one or 512 Kb Level A reserve memory, a quad - Core example device, which is mounted to the back of the board with a 1 GB LPDDR2 USB drive. With Bluetooth Low Energy (BLE) and BCM43143 Wi-Fi on platform, solutions are also 40-pin popularly accurate data returns (GPIO) and enhanced features. It also has an updated 5V USB control power source supply of up to 2.5 Amps. The Raspberry Pi 3 Model B is the best raspberry PC to date. Whenever a person enters the ATM centre to use ATM facilities in the ATM, the camera records the person's image and checks

the stored data when the image fits, the door is opened or the door is closed. L293D is a common 16 pin IC engine driver. As the name suggests, it is primarily used to drive the engines. We used DC motors to shut and open the ATM door. The DC motor power supply is provided as 12VDC to control it. An electrical mechanism that can drive or rotate the object very precisely is the servo motor. Use a servo motor if you would like to rotate an object at a certain angle or size.

**Vibration Sensor:** Vibration sensors are piezoelectric accelerometers that sense vibration. They are used for measuring fluctuating accelerations or speeds or for normal vibration measurement. Maintenance professionals use the sensors in order to predict the maintenance of the machinery, to reduce overall costs and increase the performance of the machinery. Examples of applications where the vibration sensors are used: process control systems, aerial navigation and underwater-applications. Frequency range from 0.2 up to 2500 Hz. The operating temperature of these sensors is between -50°C and +85°C.

**DC Motor:** An electric motor operated by DC (direct current) is known as a DC motor (unlike an induction motor that operates via an alternating current). A DC motor converts DC electrical energy into mechanical energy. When a current-carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. In other words, when a magnetic field and an electric field interact, a mechanical force is produced. The DC motor or direct current motor works on that principle. This is known as motoringaction.

**ESP8266:** ESP8266EX is capable of functioning consistently in industrial environments, due to its wide operating temperature range. With highly-integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness. Engineered for mobile devices, wearable electronics and IoT applications, ESP8266EX achieves low power consumption with a combination of several proprietary technologies. The power-saving architecture features three modes of operation: active mode, sleep mode and deep sleep mode. This allows battery-powered designs to run longer.

**GSM/GPRS:** GSM/GPRS modem is built with dual band sim900A works on frequencies 900/1800MHz. The

modem is coming with RS232 interface, which allows us to connect pc as well as microcontroller. The baud rate is configurable from 9600- 115200 through AT commands and it has internal TCP/IP stack to enable you to connect with internet via GPRS. It is most suitable for data transfer application in Mobile to mobile interface.

**PI CAMERA:** This 5 mega pixels sensor with OV5647 camera module is capable of 1080p video and still images that connect directly to your Raspberry Pi. This is the plug-and-play-compatible latest version of the Raspbian operating system, making it perfect for time-lapse photography, recording video, motion detection and security applications. The board itself is tiny, at around 25mm x 23mm x 9mm and weighing in at just over 3g, making it perfect for mobile or other applications where size and weight are important.

## 5. ALGORITHM

**Stage1:** The main entrance at the ATM centre is initially inaccessible. The IR sensor is used here to open the door.

**Stage2:** For face recognition, we use a camera. To open and close the ramp, we use a Servo motor here. If the face is remembered then the door gets opened if not the door would be left closed.

**Stage3:** The person must draw the cash after entering the ATM centre or he may use other services.

**Stage4:** Whenever an obstacle passes through the IR sensor, an IR sensor is placed at the money locker, it identifies and relays the signal to Raspberry Pi via GPIO pins.

**Stage5:** If an attacker attempts to steal, the money storage must be opened where the Vibration sensor is located to identify the obstruction and transmit the signal to the Raspberry Pi. The Raspberry pi then locks the door immediately and triggers the Buzzer and send the SMS.

## Advantages

- Provides complete ATM theftsecurity.
- Geological location will always be traced of an ATM machine.
- Maintain the entry of only necessary person.

## 6. RESULT

The effective functioning of an Advance ATM anti-theft using raspberry pi is one of the outcome. This technology may identify the robbery and notify the nearest police station.

All the components were connected according to the block diagram. The hardware connections and project prototype are shown below.

### Step 1: Project prototype

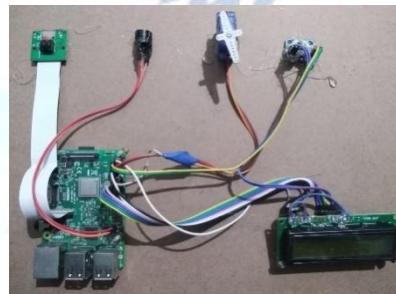


Figure 3: Project prototype.

**Step 2:** When robbery occurs the dc motor close the door and GSM sends the message to the nearby police station and to the bank and buzzer will make sound for theft indication and camera will captures images.



Figure 4: Result.

### Step 3: Sending message.

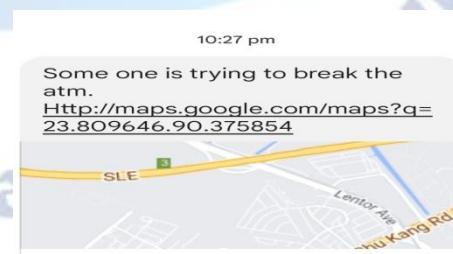


Figure 5: GSM output.

## 7. CONCLUSION & FUTURESCOPE

As we all know, these days most of the ATMs have been targeted by theft, so the drawbacks of the current

circumstances that exist in the ATMs have come to an end. Since we use a camera to identify a face, a person without a proper identification cannot access the ATM core. Registered individual data is matched to registered data through the use of camera face recognition when the door is opened and the user uses the ATM services. If the captured image does not fit the stored image, the door will stay locked. If some of the sensors like Vibration will activate, the buzzer will warn the sound, and the corresponding alert message will be sent to the designated user. Also gradual increases the theft of ATM after the year by year. This paper demonstrates how an automation of ATM theft prevention from robbery (or) thief can be implemented using GSM Technology, vibrating sensor, DC motor, Buzzer, and Camera. By implementing this project we can catch thief and robberies in ATM itself and also we can save our precious time.

As part of the expansion of this initiative, we will expand the database so that more users are stored and can access the ATM facilities safely. We may also give a caught image of crime to a local police station so that the matter can be fixed quickly. We will use this high-level banking security transfer method. We can use an efficient antenna for longer communication. Further extensions can be rendered by enhancing protection by incorporating innovative methods such as eye recognition using computer learning and artificial intelligence.

### **Conflict of interest statement**

Authors declare that they do not have any conflict of interest.

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