

An IOT Based ATM Surveillance System

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Abstract--- In the present scenario, majority of the population uses the ATM machine to withdraw cash. At the same time, there are many ATM robberies that have occurred in many areas, even if the CCTV cameras are placed in the ATM center. Hence the security system needs to be changed. In order to reduce these kinds of robberies, we present a security system for ATM theft by using a smart and effective technology. This system also analyses various physical attacks on ATM's. In our proposed system we use Face Recognizing Camera to capture the face of the person, who is entering. Tilt and vibration sensors are used to detect the irregular activities that are done on the ATM machine. The purpose of the Temperature sensor is to determine the degree of temperature present in the ATM booth. The main aim of our proposed system is to send an alert through social media's like Facebook, twitter, and Gmail using IOT and GSM network. Liquidator chloroform is used to spread the chloroform to make the thief unconscious. This system caters realistic monitoring and control

Keywords--- ATM security; Arduino; LINUX; IOT

I. INTRODUCTION

[6]The prime purpose of an Automated Teller Machine (ATM) security system is to yield solutions that would contribute several levels of protection against physical as well as electronic theft from ATMs and should also offer installation protection. An automated teller machine has several names and can be called as automatic teller machine, automated banking machine, cash machine, cash point, cash line, mini bank or bank mat. Bank mat is an electronic telecommunications device whose objective is to take up the work done by a human cashier, clerk or bank teller , thereby allowing the customers who belong to a financial institution to carry out money transaction, especially cash withdrawal independently . Now there are nearly 3 million ATMs installed worldwide. [2]In Turkey, ATM cardholders transfer money, pay bills and taxes, make mobile minute purchases at ATMs easily besides withdrawing and depositing cash, which are the traditional purposes of using ATMs. In the current day ATMs, the machine can easily verify the customer, since the he/she inserts either an ATM card which has a magnetic stripe or a plastic smart card which has a chip , which contains a card number that is exclusively unique for that card, together with some security information like expiry date or CVVC (CVV). The customer is equipped with authentication

by entering a personal identification number (PIN) which should either match with the PIN stored in the card's chip or in the database of the issuing financial institution's. Customers have a variety of advantages of using an ATM , their bank deposit can be accessed or credit accounts , to do various transactions such as cash withdrawals, check balances, or credit mobile phones .Traditional methods of ATM security is considered to be more effectively safe since the terminals are invincible to physical attack; and dispenser mechanisms were utilized . In the UK several attacks have engaged in digging a concealed tunnel beneath the ATM and cutting into the place below the ATM machine, in order to remove the money. In the present scenario, ATM security related activities focuses on, using different types of Intelligent Banknote Neutralization Systems , which is required to identify if it's a thief and thereby the machine refuses to dispense cash to the culprit. A well-known method of robbing the money from ATM is while the machine is filled with money, by the staff. To prevent this, the time during which the ATM is filled, should not be revealed to anyone, also the timings should change and must not be constant. The money is normally placed inside cassettes, suppose if it is not correctly opened, it will dye the money, in order to keep it secured. The aim of our proposed system is to improve the security of the ATM systems by using various monitoring sensors, GSM module and by uploading the current status in social medias. By using this system we can avoid robberies in the ATM centers.

II. EXISTING SYSTEM

In the existing system, we utilize emergency sirens and the camera used for security purpose is CCTV. Other research measures includes a system which uses a cost effective , embedded web server, Machine to Machine (M2M), [6]that provides realistic monitoring and control, which can work without any human assistance. By chance if there is a trespasser in the ATM kiosk, a system equipped with image processing applications and tools, serves in recognizing the intruder. However these systems, fail to live up to the expectations when the facial features that are extracted from the front face does not give us a proper ID of the interloper .In order to overcome this problem, we make use of Silhouette image.

A. Concept

In the existing system in case if the ATM machine is being impaired by the burglars, then the vibration sensor identifies the vibrations from the machine and sends an alarming SMS to the police station in the nearby premises with the help of GSM modem.[9] It has been analyzed that the most suggested means to avoid ATM fraud is through a secure electronic transaction. The existing system employs smart sensors to spot an attack and abstain it, PIR sensor, ADXL335 accelerometer, FSR sensor to ascertain motion, heat changes, abrupt acceleration, force, and vibration. ATMEGA-328 from ATMEL family is the controller being used. The system relentlessly scans its surrounding by determining temperature variations, force and orientation of the ATM with the help of the sensors. In order to prevent any filching attempt, the existing system implements suitable measures. The sensor acts as the primary source of defence and determines if there are any breakages and rouses protective measures which will prevent the burglars from performing the negative tasks, thereby successfully prohibiting the attack. The system bestows the following useful measures, sends a siren, indication to officials with the aid of GSM and visual alert in the ATM kiosk. [10] The SQL Server databases and the local disk array are used to store all forms of alarm information that is generated by ATM machine. The blaring siren and the visual alert are activated if any of the sensors are stimulated, which results in making the aggressor to abruptly stop with his actions and makes him to vacate from the place.

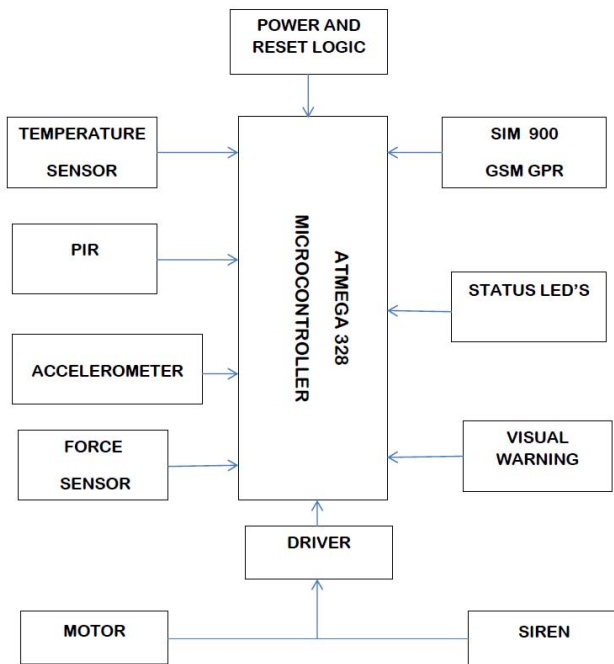


Fig. 1. Block diagram of existing system

B. Merits

The sensors used in this system are stable, tenable and easy to use.

C. Demerits

- Face is not captured during door opening.
- No video recording system under suspicious activity.

III. PROPOSED SYSTEM

This system is based on embedded Arduino for the security of ATM machine. Face is detected by the camera placed at the door; if the face is not captured then the door will not open. [5] A face recognition system is either a computer application or a biometric technique utilized for automatically recognizing a person from an image or a video frame. This can be accomplished by using various techniques such as movement of the person, skin tones, or blurred human shapes. This system gives the further information about the vibration at the door and machine by using vibration sensors. If the vibration is increased beyond the value, alerts will be sent through mail and GSM modem makes a call to wake up the authority.[4] On a regular basis, a client may access the ATM near to his premises rather than the ATM where he has an account. Hence to increase the efficiency of the system, we can have a local sever that contains the data of all the customers.

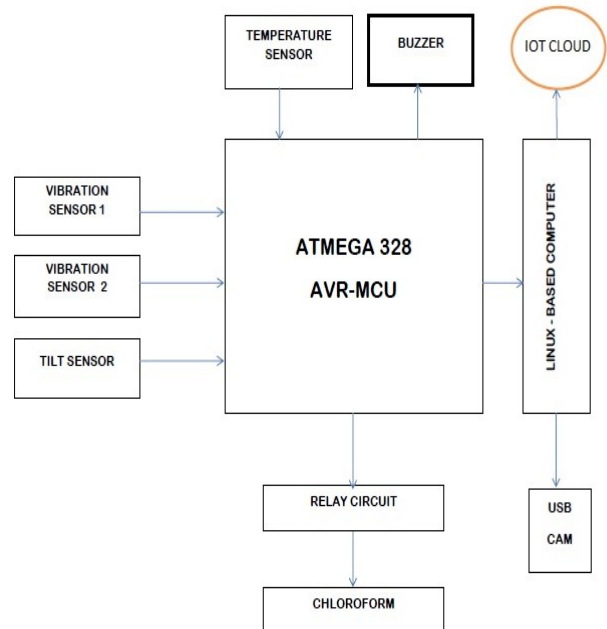


Fig. 2. Block Diagram of proposed system

IOT is used here to update the status of the current situation of ATM machine in Face book and in Twitter. This condition occurs when the vibration and tilt sensors values crossed its limits. At last if none of the sensor works, the chloroform which is connected using relay is automatically switched ON to make the thief unconscious and alarm sound is ON to wake the nearby passers. This system is mainly focused to catch the thief and to reduce the ATM robberies by increasing the security.

The proposed system is explained in detail below by description of hardware and software used and their features and the purpose of the components being used is explained which will give a clear picture about the proposed system.[3] The novel ATM system must consider the changes in security risk profiles which occurs due to cyber attacks, telecommunication systems spoofing and ground physical attacks, which based on the new ATM architecture can create an awareness about their negative effects from one node up to a global level because of chain reactions and domino effects.

A. Temperature Sensor

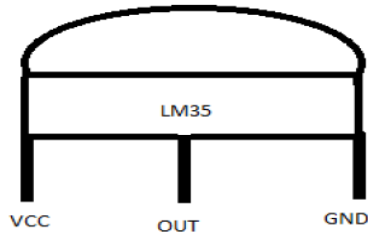


Fig. 3. Temperature sensor

The most commonly-measured environmental quantity is Temperature, since most of the physical, electronic, chemical, mechanical, and biological systems are affected by it. Temperature monitoring can be put into action either directly with the aid of heating source, or in a remote manner utilizing radiated energy.

B. Vibration Sensor

To check if there are any vibrations that occur above the threshold value, the sensor SW-420 and Comparator LM393 are used. The on-board potentiometer is used for adjusting the threshold value. If vibrations are detected, it will be indicated in the output as Logic HIGH and if no vibrations are detected, it will be indicated as Logic LOW, both of which will be indicated by a led.

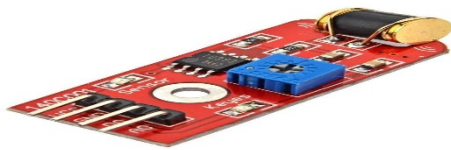


Fig. 4. Vibration sensor

C. Tilt Sensor

If there is any variation with an angular movement (if the intruder tries to tilt the ATM machine), then the Tilt sensors produce an electrical signal.



Fig. 5. Tilt Sensor

These sensors are used to quantify slope and tilt that occurs within a restricted range of motion. At times, the tilt sensors are also called as inclinometers since the sensors provoke a signal whereas inclinometers produce readout as well as a signal.

D. GSM Modem

This module provides its support for both software power on as well as reset. [1] If the ATM is destroyed then a message is transmitted to two prime stations through GSM. Suppose if the cash box is robbed, GPS is utilized to trace the location. It can commune with controllers through AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands).



Fig. 6. GSM Modem

E. Relay

A relay is basically a switch that is operated electrically. A magnetic field is created by the electric current that flows through the relays coil as a result of which the switch contacts get changed and it influences a lever. The relays possess two switch positions, so that the coil current can be either ON or OFF and there are double-throw switches also available. It contains a coil of wire encompassing a soft iron core, an iron yoke, which renders a low reluctance path for magnetic flux, a mobile iron armature, and a set of contacts. In this condition, there are two sets of contacts in the relay in which one set is closed and the other set is open.



Fig. 7. Relay Switch

F. Chloroform

Chloroform, or Tri - chloromethane whose chemical name is CHCl_3 . Properties of Chloroform are, it has no color, aromatic smell, dense liquid that is used as a prototype to PTFE and refrigerants and hence generated in ample amounts. The sole purpose of using chloroform is to make the thief un-conscious. [8] The proposed system thereby strengthens the security of ATM's against threatening attacks in a better manner.



Fig. 8. Chloroform

IV. ALGORITHM

Step 1: Start the program.

Step 2: Detect the face, if the face is not detected send the mail.

Step 3: If the Vibration sensor at the door is damaged, if (value>500), door has been broken and the mail will be sent.

Step 4: If the Vibration sensor at the ATM machine is damaged if (value>500), ATM machine has been broken and the mail will be sent.

Step 5: If both the vibration sensors at ATM machine and door, tilt sensor at ATM machine is broken then the mail will be sent, relay will be on (chloroform), alarm is on, call through GSM & tweeted.

Step 6: Stop.

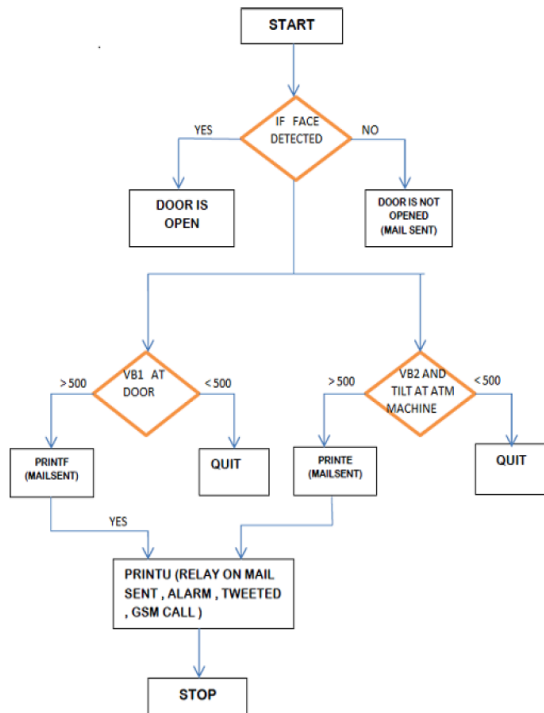


Fig. 9. Flow diagram of Proposed system

V. RESULTS

The design and the embedded system implementation based on Arduino are proposed in this project for smart ATM security purpose. This project work aimed at providing the security system with good performance, clear structure and good scalability. The hardware circuit mainly aims at monitoring the various sensors. The multi information is collected and processed using Arduino microcontroller. [10] ATM machines are established monitoring appliances. When a failure occurs in these ATM machines, at once the monitoring equipment can deliver alert information and warning messages to the background database. The various results obtained using the sensors are,

- The vibration sensor is used to record the vibration value at the door and at ATM machine. When the vibration value exceeds the normal value, the mail will be sent.

- The tilt sensor is employed to get updates about the ATM machines condition. When the machine is tilted the tilt sensor turned ON and notifications will be sent through mail.

- The temperature sensor records the temperature value prevailing within the ATM booth. The normal value is stored in the temperature sensor. When the temperature value inside the booth exceeds the normal value, the mail will be sent and it is tweeted in pages.

- When all the sensors values exceed the normal values the chloroform is switched ON automatically and the alarm sound is decoded. [11] In most of the cases the alarm information is said to be false, only a small fraction is true. To overcome this drawback we go for data visualization. Finally, the status is uploaded in Face book and in Twitter pages.

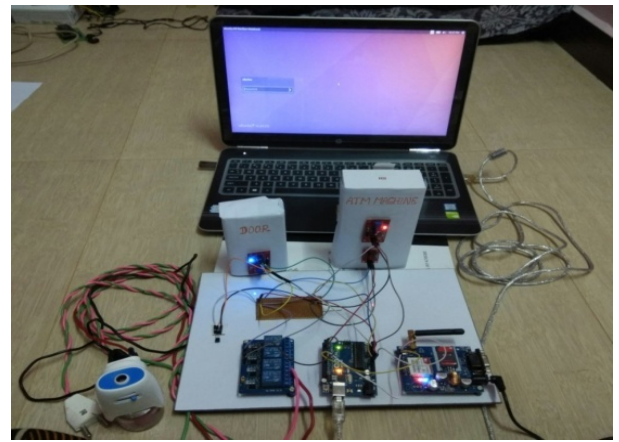


Fig. 10. Hardware board: kit diagram

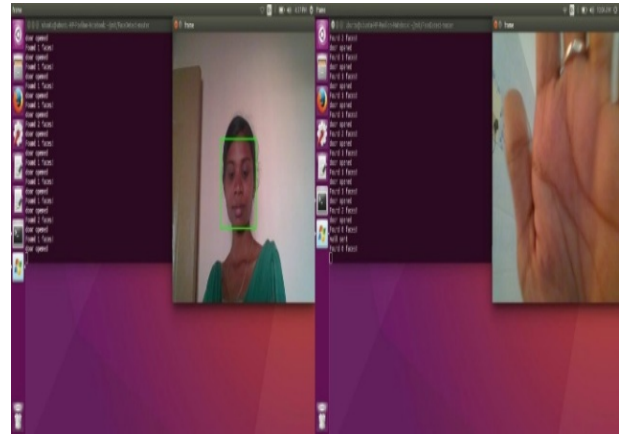


Fig. 11. Simulation result for face detection and not detection

From the above simulation, when the face is detected the door opens and when face is not detected the mail is sent. [5] Face recognition begins with a picture, trying to determine a person in the image.

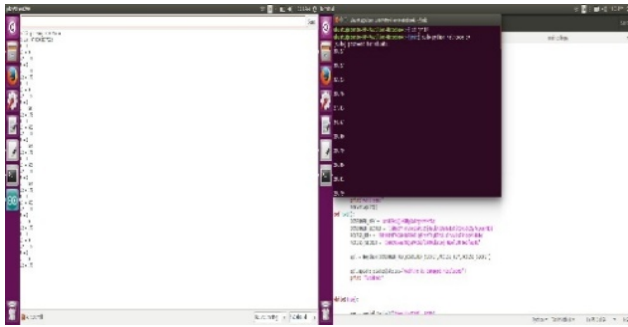


Fig. 12. Simulation Result for Temperature and Vibration Sensor

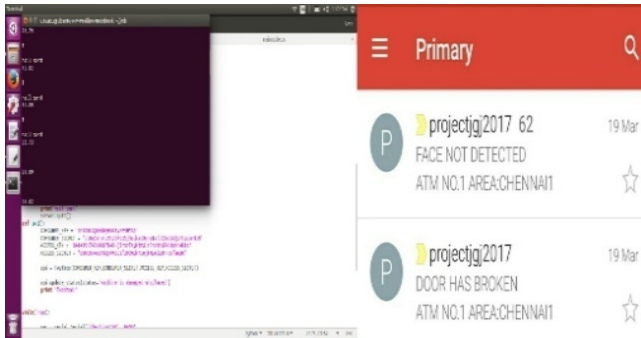


Fig. 13. Simulation Result for sending mail and result mail page

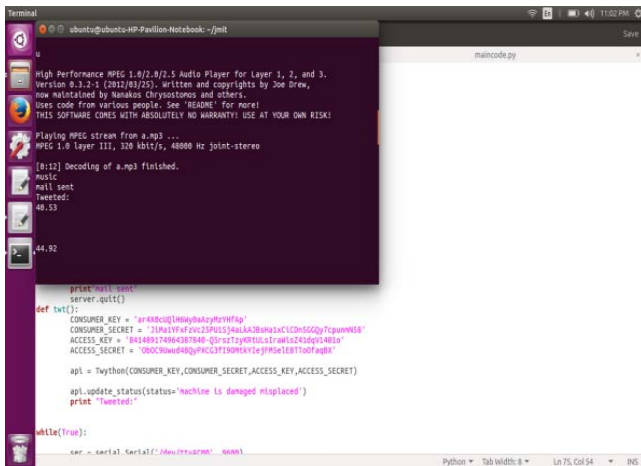


Fig. 14. Simulation Result of Twitter and Facebook

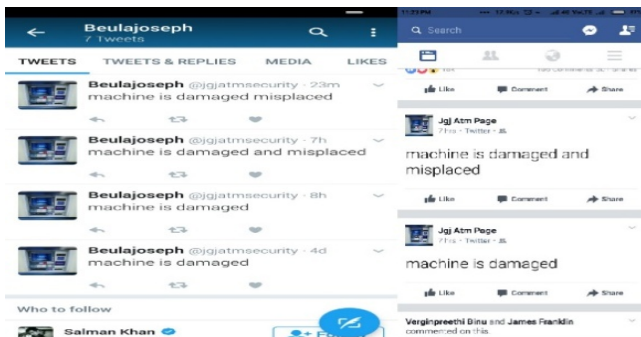


Fig. 15. Output of Twitter Page & Output of the Face book page

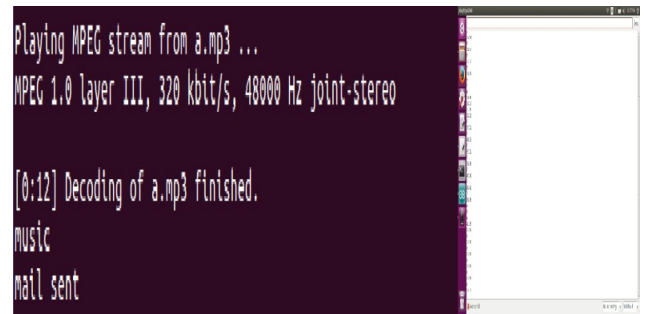


Fig. 16. Simulation of alarm sound and output window of Arduino IDE serial monitor

When the sensor value exceeds above the normal,

- The mail is sent.
- Relay turns ON.
- Chloroform is switched automatically.
- Allows call through GSM modem.
- Status is tweeted.

VI. CONCLUSION

The most abstruse networking technology we have come across is the ATM technology. The most difficult task is to protect such a recondite system. As of now, people have just commenced to talk about some issues pertaining to ATM security. [6] Security experts are ready to come to people's aid, to solve the issues relating to ATM security and ATM loss prevention systems. It will consume time for us to determine how to totally fulfill our security targets. The aim of ATM is to render a combined networking platform and communication infrastructure, ATM security requires to be more flexible and adaptable with other techniques. This will welcome ample constraints to ATM security.

As we mentioned before, our method uses Arduino as its controller device, with the help of sensors concerned with factors like temperature, vibration and tilt monitors and ensures safety and security from robberies and human interferences. [7] Our system thereby does not require a continuous human supervision, minimizes the storage of unwanted video feed and thereby disseminates only an aberrant situation, a quicker reply to a menace determined by the system is performed by shutting down the ATM machine. Our project will be very useful for our Indian government to provide security for ATM and to prevent robberies.

This design is proven to be efficient and a convenient monitoring system for ATM security.

VII. FUTURE ENHANCEMENT

In future we can also use thermal sensors to detect the number of persons inside the ATM booth. [1]IR sensor can be used, to detect if the card holders is present in the ATM booth and hence turn on Fan or AC .We can incorporate a novel methodology named OTP generation technique with secret

query and salting procedure, which will cater enhanced security for utilizing the ATM in a cost effective basis.

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