

A Real Time Prototype Model for Enhancing the Security Features in the ATM Units

Kavati Srinivas, A.V. Prabu, Kandi Sambasivarao

Abstract: Nowadays people prefer ATM more than banks for money transactions like withdrawal, deposit and money transfer. It has become the most important aspect of financial issues. The development rate of ATM units is exponentially high as a result of their multi practical uses. With the increase in the number of ATM, the thefts occurred also are increasing. The banking sectors had already secured from the thefts related to software. But ATM must be secured from physical attacks. The proposed framework which can provide better security to the ATM units which are happened by the physical attacks. By integrating the MEMS and PIR sensor to the micro controller unit. When irrelevant things happened to the ATM unit, the tilt angle of the MEMS sensor vary immediately it sends signals to the microcontroller unit. The microcontroller which was interrupted by the sensor it does the concurrent things like shutting the entryway, passing the information to the higher officials, nearby police station using GSM. The alert buzzers are activated for warnings. Here PIR sensor attached to the micro controller unit it allows only one person inside the ATM why because sometimes a group of people can damage the ATM to steal the money.

Key words: MEMS sensor, PIR sensor, Microcontroller unit, GSM, GPS, DC Motor.

1.INTRODUCTION

An automated teller machine is one of the renowned automation across the globe. Due to its numerous functionalities like the transference of funds, with drawl of funds for doing these activities user should not go their respective branch office. The user can do all these with keycard or ATM card which is pass coded with the details of the user. The main speculation behind the successfulness of ATM units is because these are user-friendly automation. The user can easily understand the mechanism of the ATM unit. By using ATM unit the chance of getting errors will be low some errors which were frequently occurring in the branch offices like sometimes giving the damaged notes to the user, improper fund statement etc. [1]. In ATM there is no such type of issues occur. In fact, by adopting ATM in every area, the work pressure on the banking staff will be

less. With all these benefits the growth rate of ATM will be creeping in every year. In future, we can see many more ATM units with advanced technologies. The below graph shows the prediction analysis of growth rate in Asia with the remaining world up to the year 2022.

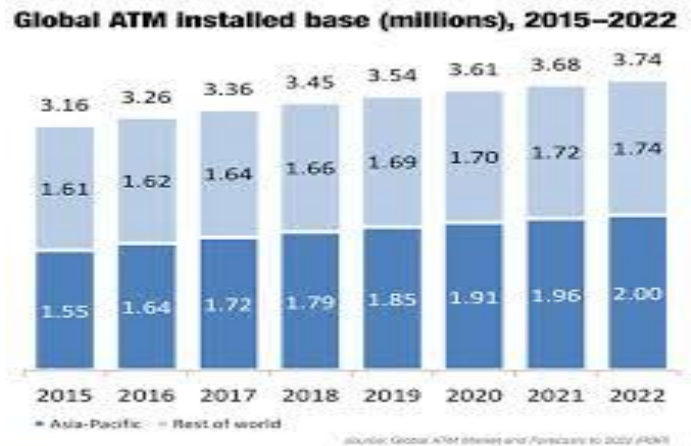


Figure 1 Growth rate of ATM units across the globe

In the above figure, we can observe the blue color indicates the growth rate of ATM in Asia creeping high from year to year[2]. So we can see many more ATM units in future that is going to be adopted by the banking sectors.

In general, the ATM is classified into three types based upon their location where they are placed. The first one is an on-site ATM which they are adopted in their respective bank branch buildings. The second type of ATM units are defined as off-site ATM's are located far distanced from the branch office that includes remote areas also for the connivance of the people. The other type of ATM's is known as stand-alone ATM's which we have seen in bus stations, railway stations, malls, public crowded places etc. The crime rate related to the ATM units has been increasing along with the development rate of the ATM units. There are different types of thefts are done by the culprits. Physical attacks on the ATM centers is one of the thefts has taken into consideration [3]. Physical attack is nothing but destroying the ATM unit especially money cabin of the ATM unit, moving the whole ATM unit into another place. In general, the ATM which was subjected to physical attacks by the group of people. We have seen these type of thefts more often in remote areas. The culprits target the offsite ATM where they can do finish their work easily. For these types of thefts, a real-time prototype has developed to reduce the theft rate in offsite ATM units.

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Kavati Srinivas, M.Tech student in Embedded systems in ECM Department, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India.

A.V.Prabu, Associate Professor, Department of ECM, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India.

Kandi Sambasivarao M.Tech student in Embedded systems in ECM Department, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India.

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The proposed system can make the ATM defend from the physical attacks without any human interference from the physical attacks if any suspicious things happened to the ATM unit like destroying, moving etc. In those cases, the mechanical shutters are closed by using DC motor. The alert information will send to the higher officials and police station. By allowing the only person inside the centre that makes the chances of reducing the physical attacks to the ATM unit.

II. RELATED WORK

This survey gives some crucial figuring out how to accomplish the goal of the proposed system. The main goal of the proposed work is to improve the security features for the ATM units against the culprits. We will also analyse the data identified with the examination and research that assumes a vital job for the improvement of the proposed technique. One system is developed based on the LPC 2129 as the microcontroller unit integrating with the PIR sensor. The sensor used in this system is to detect the human motions [4]. The whole system works on the working principle of the sensor. If any irrelevant movements are caused inside the booth, then the sensor processes the data and sends it to the micro controller unit. It is going to be a quite difficult task for the sensor if a more number of people are present inside the booth. We cannot predict the human motions accurately in that scenario. The embedded system based prototype is designed for anti-theft of ATM.

The integration of the vibration sensor with ARM controller the system process the data able to do certain things like message transmission, leakage of gas etc. [5]. The system can working principle depends upon the readings of the vibration sensor. It gives information when the ATM unit subjected to some pressure. If the ATM unit is moved or stolen, then it was not able to process the data. The automation is developed by using an embedded web-based server. The raspberry-pi module is there for transmitting the obtained data from the cloud[6]. The system works on the platform of the Linux operating system.

Additionally RFID reader is there at the entrance of the booth. The user carries the RFID tag along with the keycard to access the service of the unit. Otherwise, he cannot be able to enter inside the booth. An image processing algorithm is proposed to reduce the crime rate related to the ATM units.

It is developed on the idea of every user's face must be recognized before they are entering into the booth. One camera is fixed at the entrance of the booth if the user is wearing the mask, spectacles, caps he cannot be able to enter inside the booth[7]. An advanced ATM security system is designed with the integration of many hardware resources like biometric system, palm scanner, face recognition sensor [8]. The user data must be processed with all these equipment then only he will allow doing his transactions. Also with this equipment, the pressure sensor is also there for any type of pressure subjected to the unit. By implementing this model in real time conditions may face some challenges like high-speed internet connection, cost effectiveness, complexity etc.

More often we can see the thefts related to the Automated teller machines while the banking sectors also took some steps to reduce the crime rate like placing CC cameras inside

every booth for monitoring the unit around the clock. But there is a chance the cameras is being destroyed by the culprits. In such cases, monitoring of the particular ATM was not possible. Some banks appointed the security guards for protecting the ATM unit against the culprits. But many ATM units are there due to the lack of guards, even though the guards are there the group of culprits attack on the security guard to make their work easier.

III. PROPOSED METHOD

The proposed system is designed to secure the ATM unit with efficient manner. The system is developed with the integration of a MEMS sensor and PIR sensor to the microcontroller unit. Here the ATMEGA 328P based microcontroller has taken for the accurate data processing. If any pressure or irrelevant movement happens to the ATM unit then immediately the tilt angle of the MEMS will change and sends the data to the micro controller unit. The microcontroller is able to process the concurrent things like message sending with the help of GSM technology, closing of mechanical shutters at the entrance of the booth by using DC motor. GPS is used to track the location of the booth. The exact location of the ATM booth will be sent to the higher officials in that message sent by the GSM. The buzzer will make alerting sound inside as well as outside of the booth. By adapting this method, we can catch the thief in the booth only.

IV. BLOCK DIAGRAM

The figure [2] represents the block diagram of the proposed system. The sensors which are integrated to the micro controller can process the data with their respective specifications. The MEMS sensor interfaced to the micro controller unit with the integration of ADC 0804. The relay is used to drive the motor for closing the shutters. LCD is there to know the process of the GSM after theft happens. Here piezoelectric type buzzer is interfaced to make the alert sound.

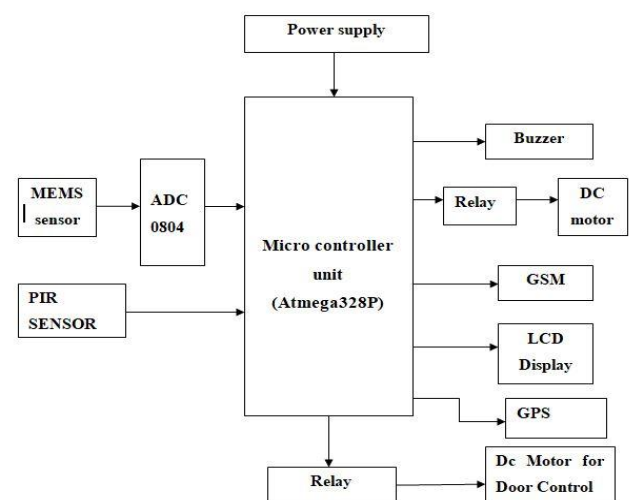


Figure 2 Block diagram of the prototype model

V. HARDWARE RESOURCES

In this section, we are going to discuss the features of some key hardware modules used in the prototype with their functionalities. Among all those components used in the proposed system, MEMS sensor has played a prominent role after the micro controller unit.

ATMEGA 328P micro controller

The micro controller used in the designed prototype belongs to the AVR family, and it is 8-bit microcontroller having 32KB of Flash ROM, 2KB of SRAM, 1KB of EEPROM operating in the frequency of 20MHZ. It is simply described as the heart of the designed prototype.

MEMS SENSOR:

The micro electro mechanical system was abbreviated as MEMS. The main working principle of this sensor is based on the tilt angel. Normally the sensor is placed in a predefined position in the ATM unit. If any movements are subjected to the sensor then immediately the tilt angle is varied. The MEMS is interfaced with the microcontroller with ADC 0804 convertor. Although the controller has ADC feature by using this convertor we can get accurate results in real time conditions [9].

PIR SENSOR

The passive infrared sensor is abbreviated as PIR. The PIR sensor used in our proposed system for detecting the human motions. Based upon the human motion the automatic door closing and door opening will be done. It allows only one particular person at a time inside the booth. The normal range of the PIR sensor lies between 5 meters to 12 meters. The working feature of the sensor if any obstacle occurred in the infrared medium that it leads to yield voltage which triggers the motion recognition [10].

VI. RESULTS & DISCUSSION

Initially, the circuit is connected as shown in the below figure. The pin connections of the hardware components are integrated into the micro controller unit with their allocated pins. Two DC motors are connected for as shown in figure[3]. One is for closing the mechanical shutters of the ATM, and another is for automatic closing and opening the doors of ATM. GSM is used for sending the message to the nearby controlling office and buzzer is used to produce the alert sound within the ATM when the theft is occurring. The above fig [3] is the general connections made without power supply.

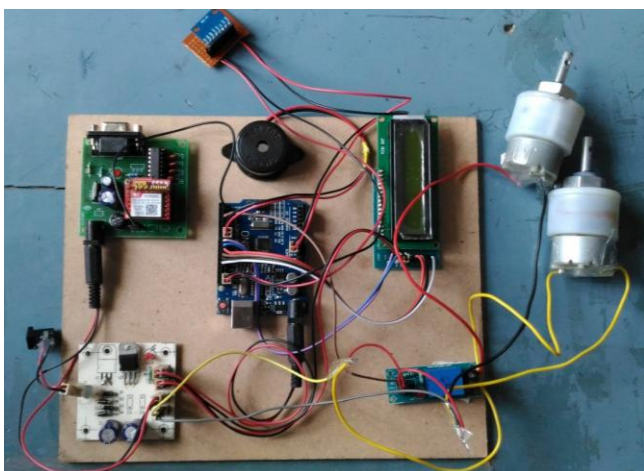


Figure 3 Prototype development model

When the power supply is given, the microcontroller unit will be activated. Here 5 to 12 volts power supply is required. Initially when the kit is activated by the power supply. In figure[4] the LCD display shows the initial position of the ATM on display. Here the position of the MEMS sensor is not disturbed so that the Relay is not activated yet. When the MEMS sensor position is changed which indicates that ATM is attacked by theft. Then buzzer is activated to make alerting sound within the ATM.

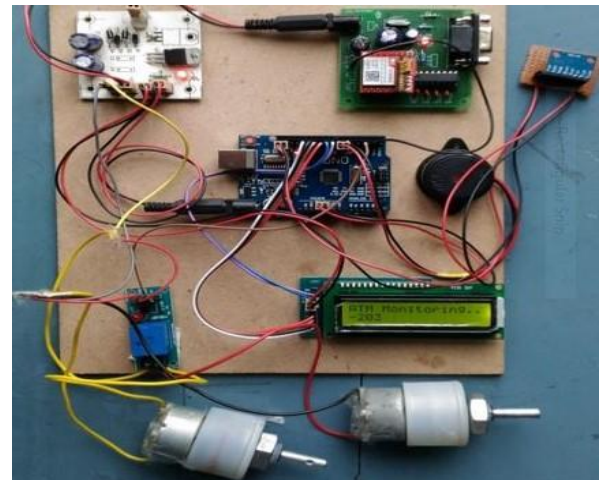


Figure 4 working model of the proposed system

GSM is used to send a message to the nearby controlling office that message is displayed on the LCD screen as shown in the fig. Now relay is activated so that the DC motors come into working state which is used to close the mechanical shutters of the ATM.

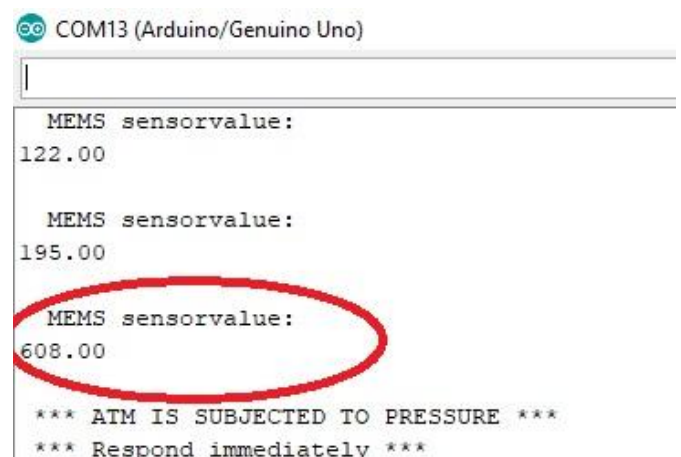


Figure 5 Displaying the sensor values in the serial monitor

The figure [5] clearly shows the working mechanism of the prototype. When the system is activated the MEMS sensor continuously reading the data, if the sensor data exceeds one particular value then immediately the micro controller unit will do concurrent things.

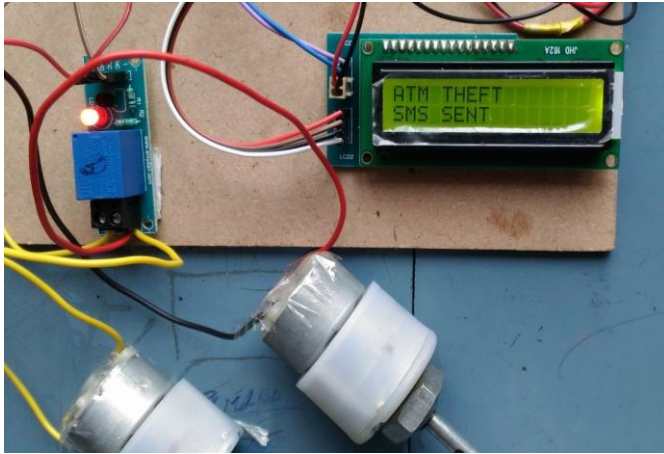


Figure 6 Working of the system after the theft occurred

The figure [6] displayed the messages sent by the GSM technology in the LCD display after the robbery occurs

ATM Theaftning <http://www.google.com/maps/place/16.4419964,80.6223509>

ATM Theaftning <http://www.google.com/maps/place/16.4419964,80.6223509>

ATM Theaftning <http://www.google.com/maps/place/16.4419964,80.6223509>

Apr 18, 10:52 AM • via airtel

Figure 7: Alert messages to the higher authorities

The Figure [7] shows the received message to the higher authorities and police station in that message we observed that GPS link is also there to track the exact location of the ATM unit instead of searching the particular ATM booth.

VII. CONCLUSION

The proposed system is a simple, low-cost, effective model to enhance the security features of ATM units. It can give accurate results in real-time conditions. Even in remote areas also the efficiency of the model is good. The entire hardware setup is installed inside the ATM unit any irrelevant things happened to the unit the microcontroller unit will do concurrent things. We can catch the burglar inside the ATM at the time of the robbery in the ATM booth only. By implementing this idea, we can save our valuable time rather than the conventional methods like banking organizations reporting about the robbery and police need to start from ground level to investigate and catch the culprits. This system will lock up the burglar inside the ATM using mechanical shutters which helps the police to catch the burglar within the ATM centre and take necessary legal actions appropriately.

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AUTHORS PROFILE



First Author. Kavati Srinivas, M.Tech student in Embedded systems in ECM Department, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India. He completed B. Tech in E.C.E from Sri Mittapalli College Of Engineering JNTUK in the year 2017.



Second Author :A.V.Prabu Associate Professor, Department of ECM, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India. He completed B.E from ANNA UNIVERSITY, M.Tech from BPUT, pursuing Ph.D in JNTUK, KAKINADA .



Third Author Kandi Sambasivarao, M.Tech student in Embedded systems in ECM Department, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India. He completed B. Tech in E.C.E from Nalanda Institute Engineering Technology ,JNTUK in the year 2016.