



---

## International Journal of Intellectual Advancements and Research in Engineering Computations

---

### Enhanced Surveillance System for ATM Using PIC Microcontroller

M.Srinevasan<sup>1</sup>, S.Elanselvan<sup>2</sup>, P.Miruthula Samyuktha<sup>2</sup>, R.Monisha<sup>2</sup>, R.Nivedha<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of ECE, Nandha Engineering College (Autonomous), Erode-52.

<sup>2</sup>UG Students, Department of ECE, Nandha Engineering College (Autonomous), Erode-52.

---

#### ABSTRACT

In this modern scientific world, technologies are transforming rapidly but along with the ease and comfort they also bring in a big concern for security. ATM today has become areas of target due to their easy and readily available cash at everyone's convenience. The attacks on ATM are steadily rising and there is a serious problem for law enforcement and banking sectors. In this paper, Automated Teller Machine (ATM) which is based on embedded technology including smart sensor are used to monitor its surroundings for dubious activities like physical attack or jeopardize the ATM. The ultimate aim of the project is to provide security and safety measures that can be implemented to prevent such attacks by proper surveillance. This paper analyses the different forms of physical attack on ATM's and discusses the methods that are used to capture the frauds, commences proactive measures and tip-off officials through GSM network. The proposed system heightens the security of ATM's against imminent attacks effectively.

**Index Terms:** PIC Microcontroller, Shock shield Vibration sensor, Venom Gas Leakage, Automated Door Locking Mechanism, SIM 900 GSM Module, Code Composer Studio(CCS)

---

#### INTRODUCTION

Nowadays, banking sector is one of the most important parts of a human day to day life. Banking facilities are widely used by people for their economic activities. Automated Teller Machine (ATM) is a computerized machine which is used for accessing a bank account from anywhere without the help of bank staff. The user can perform several banking activities like cash withdrawal, money transfer with the help of ATM. ATM benefits are numerous, vast and a great deal to help communities without having to travel miles, Saving time and money. In present scenario, the theft happened in the ATM's are increasing day by day. Frauds related to the ATM which is a serious issue in the society. Recently we have seen

many cases wherein a group of people entering into ATM and overpowering the security personnel and stole the money from the ATM. It is impossible to handle the group of robbers by a single person. It has become very much necessary to increase the security of the ATM machines. A single CCTV camera situated at the corner of the ATM isn't enough to provide much security since it only captures the video footage of what have been going on in the ATM but doesn't take any measures as such the thief is imprisoned and handed over to the law.

The objective of this project is to handover the culprit to the police and at the same time informing the concerned officials and police station about the activities that has been occurring in the ATM.

---

#### Author for correspondence:

Department of Electronics and Communication Engineering, Nandha Engineering College (Autonomous), Erode.



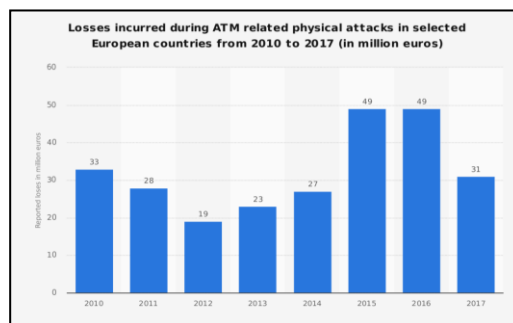
**Fig.1.ATM MACHINE**

## LITERATURE SURVEY

It is observed that the number of crimes related to ATM is rapidly increasing. In the beginning, GSM based security is provided in which One Time Password (OTP) is sent to registered number for transaction. The combination of GSM and RFID technology is also used which makes the system secure than only RFID technology. This technology has drawback so, biometric technology is introduced for ATM transaction. In biometric method fingerprint and face recognition system are used for ATM transaction. Fingerprint recognition system for ATM transaction is used because each customer has unique fingerprints So this system provides more secure transaction than GSM. Face recognition method is also used for security in which face is recognized from 3 angles for authentication purpose. Also, security is enhanced with OTP & facial recognition features. In this system, current face image matched with stored

image and after matching the images correctly, OTP will be send to registered number user have to enter the OTP number for completing transaction. There are many systems available for securing transactions, but there is no particular system to secure ATM machine. So The Idea of Designing and Implementation of Security Based ATM Security is to design a smart Atm which should be used in real time application. The main objective of our project is to catch the robbers when an attempt is made to stole the ATM. This system will also act as a security barrier for the ATM Machine.

The statistic given below shows the number of ATM physical attacks like tampering and breaking the ATM. Based on the given data, the numbers of physical attacks on ATM machines are over two thousand in 2010. After it was decreased to 1,818 in 2012, but it was increased between 2015 with 2,657 attacks and 2017 which shown 3.6 thousand physical attacks given in the figure [2].



**Fig.2. Number of ATM-related physical attacks in selected European countries from 2010 to 2017**

## DOMAIN

### EMBEDDED SYSTEM

An embedded system is a combination of hardware and software where software dumped into hardware controller. An embedded system is

nothing but a microcontroller or microprocessor based system which is designed to perform a specific task. In our day-day life we frequently use many electrical and electronics kits are designed using Embedded system technology. It is a combination of Hardware and software, fixed in

capability, programmable design for a specific function with a specific time. Embedded system hardware is built with a microprocessor or microcontroller. It has the elements like input output(I/O) interfaces, memory and display. It is a microprocessor based system which is used to monitor and control the components of the device.

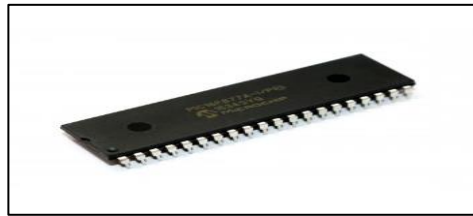
An embedded system has three components:

- It has hardware.
- It has application software.
- It has Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works. It makes the rules during the execution of application program. A small scale embedded system may not have RTOS.

## HARDWARE USED AND ITS DESCRIPTION

### PIC16F877A MICROCONTROLLER

PIC is a microcontroller which was originally developed in the year 1993 made by microstrip technology and it was initially developed by General Instrument Microcontroller. The name PIC originally termed as "Peripheral Interface Controller" now it is named "PIC" only. It is a 8-bit microcontroller. It consists of 40 pin which has 33pins for input and output. It has 256 bytes EEPROM, self-programming and 2 nos of PWM and built in clock source. The main advantage of PIC is write-erase as many times as possible because it uses FLASH memory. PIC has the efficiency of low cost, easy availability, large user, free development tools, serial programming. PIC16f877a has used in many digital electronics circuit.

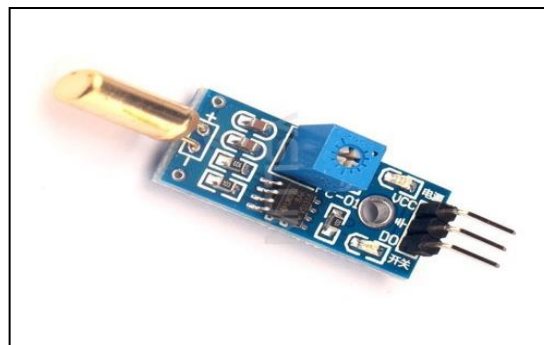


**Fig.3. PIC16F877A**

### VIBRATION SENSOR

Vibration sensors are used for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration. It is a device which is used to measure the seismic vibration and converting into a electronic signal. As the incoming signal comes into an analog signal, sensors are linked to a data acquisition unit

to convert its output into a digital format that can be read by computers. This system works according to how much the force applied to the device. If no vibration in the device produces LOW output. If it feels vibration then output produces HIGH. The circuit which operates under the voltage between 3.3V to 5V DC.



**Fig.4. Vibration Sensor**

## VENOM GAS LEAKAGE

A toxic gas or spray is used to emit denser vapour as like fog or smoke. The artificial fog is used widely for security purposes. The toxic gas is mixed with cooler and outside air the vapour condenses, resulting in a thick visible fog. The release of the harmful toxic gas in the machine makes the person unconscious which prevents the further activities inside the ATM. These type of gases are widely used by technicians and engineers for security purpose.

## AUTOMATED DOOR LOCKING MECHANISM

The automated door opener system is used to open and close the door automatically. The

automated door lock is kept at the entrance of Automated teller machine housing or kiosks. DC motor is an electronic machine used for automatic door locking at the time of theft which **converts electrical energy into mechanical energy** and it is based on the principle that. When a current carrying conductor experiences magnetic force, which is placed in a magnetic field. Whenever the theft tampering or breaking the ATM, the motor which receives input from the PIC microcontroller, at that instant the door will be locked automatically and the culprits are locked inside.

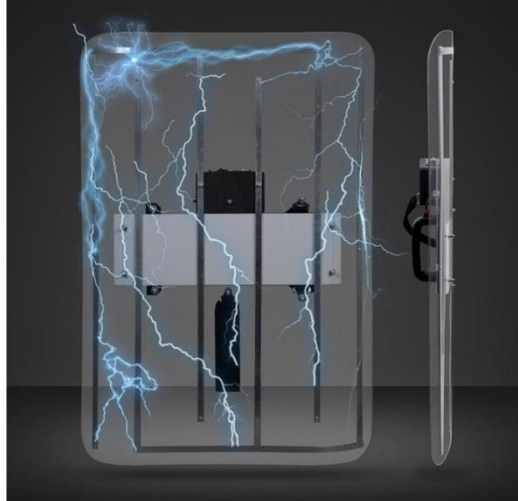


**Fig.5. Automatic Door Lock**

## SHOCK SHIELD

The shock shield is primarily made up of three layers of metal mesh and is rather a complicated assembly. The inner central layer is actually the hot mesh and is terminated as a high voltage source from the circuit enclosed in the lower handle area. The outer two layers are simply connected with the negative of the battery. The inner and

outer layer are kept at a particular distance, then the high voltage from the central mesh is unable to arc-off through the outer layers, but when a thief tampered in this trap and bridges itself in between the layers, the person's body creates a low resistance path in between the layers of the mesh so that the high voltage is now able to arc through the body of the particular person which is instantly electrocuted.



**Fig.6.Shock Shield**

### **BUZZER**

A Buzzer is device which is used to produce buzzing or beeping noise. There are several kinds of buzzer which may be mechanical, electromechanical or piezoelectric buzzer. A Buzzer is considered to be an indicator which indicates something happening in an circuit. The most common buzzer is a piezo buzzer which differs from a magnetic buzzer because it is

driven by a voltage rather than a current. A piezo buzzer behave as a capacitor whereas the magnetic buzzer is connected in coil with capacitor. Normally the operating voltage of magnetic buzzer is from 1.5v to 24v, for a peizo buzzer is from 3v to 220v. It has several application in electronics like DC power supply, electronic toys, telephones and timers and other electronic products for sound devices.



**Fig.7.Buzzer**

### **LIQUID CRYSTAL DISPLAY (LCD)**

An LCD is an electronic display module which uses liquid crystal to produce image.. Liquid crystal do not emit light directly instead of that it produces images in color or monochrome. LCD are

used to display arbitrary images with low information content such as preset words, digits and seven segment displays as like digital clock. LCD display are used widely in LCD televisions, computer monitors, watches and calculators. A 16\*2 LCD display is a very basic

module. It can display 16 characters per line and there are 2 such lines. In LCD each character is

displayed in 5\*7 pixel matrix.



**Fig.8.2\*16 LCD Display**

### **SIM 900 GSM MODULE**

Global System for Mobile Communications (GSM) is mainly used to provide mobile communication in most of the countries. The idea was developed at Bell Laboratories in 1970. It is mainly used for transmitting mobile voice and data

services. This was further used to implement 3G, 4G and 5G networks. The SIM card mounted GSM is used to receive digital commands by SMS from any cell phone and send the data to the MC through serial communication.



**Fig.9.SIM900 GSM Module**

The SIM900 consists of a Quad-band GSM/GPRS solution in a SMT module. It can be embedded in the customer applications. It is an industry standard interface device, it produces a frequency of 850/900/1800/1900 for voice, SMS and fax. This module uses very low power consumption. The configuration of SIM900 is 24mm x 24mm x 3 mm. It is suitable for almost all the space requirements in the M2M application.

### **POWER SUPPLY**

A power supply is an electrical component that supplies power from the outlet to many parts present inside an electrical circuit. The function of the power supply is to convert from a source to voltage, current and frequency to power the load. All digital circuits are worked under the DC power supply. The power supply unit consists of

transformer, filter and a regulator. A 230v AC power supply is used to connect to a transformer which step downs the voltage to a desired level. A diode rectifier is used to provide a fullwave rectified voltage and it is filtered by a capacitor to produce DC voltage. Regulator circuit is mainly used for remains the DC voltage in the same value even if the DC voltage varies or the load connected to the output. The DC voltage is obtained from the AC supply after rectification, regulation and filtration.

## SOFTWARE DESCRIPTION

### CODE COMPOSER STUDIO (CCS)

**Code Composer Studio (CCS)** is an IDE (Integration Development Environment) Integration Development Environment which supports both microprocessor and embedded system. CCS which comprises of tools used to

develop and debug embedded applications. It also consists of C/C++ compiler, source code editor, project build environment, debugger, profiler, and many other features

### SPECIFICATION

- Operating system: Windows, Linux and macOS
- Developed by: Texas Instrument
- Platforms: x86-32 (32 bit Intel X86), X86-64

### FEATURES

- MSP Low Power MCUs
- C2000 Real-time MCUs
- SimpleLink Wireless MCUs
- TM4x MCUs
- TMS570 & RM4 Safety MCUs
- Sitara (Cortex A & ARM9) Processors
- Multicore DSP and ARM including Key Stone Processors.

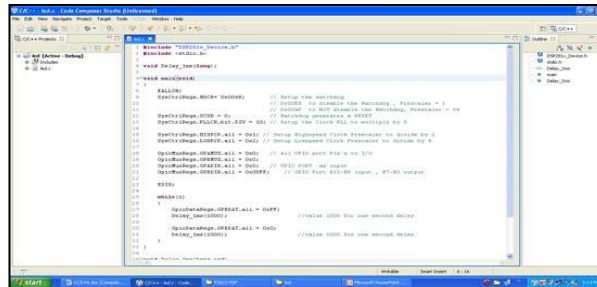
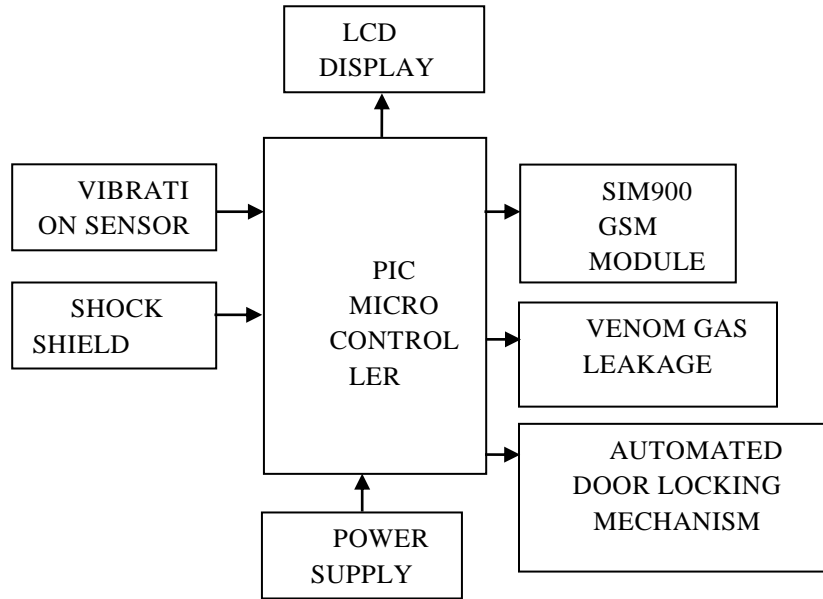


Fig.10. Editor Window

## THE PROPOSED SYSTEM

The proposed system is used to detect an attack and avert it. This system consist of Shock shield, vibration sensor, Automated Door Locking

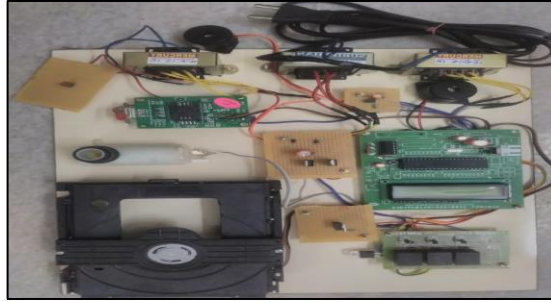
Mechanism, Venom Gas leakage, Buzzer and GSM module. The controller used here is the popular PIC16f877a Microcontroller.



**Fig.11.Block Diagram of the Proposed System**

Initially, the power supply is switched on.,the input 230V AC voltage is step down by the transformer and the supply is transferred to all the devices in the circuit. The proposed system which consists of two transformers,One is used to supply 5V voltage for controller , GSM module and the entire circuit. Other is used to supply 12V for toxic gas leakage.At the beginning GSM gets the signal strength from the networks. .If the signal attained, controller resets and finally location has tracked. This system provide enhanced security in two aspects: Generally ,the ATM machine consists of three lockers. The concerned Bank officials provide password and security key for opening the ATM machine.Whenever the robbers that may jeopardize or physically attacking the first and second layer of the ATM machine,then the controller buffers a piezoelectric transducer(vibration sensor), As soon as the transducer is displaced from the mechanical neutral axis, bending creates strain within the

piezoelectric element and produces voltage.The device will behave as a vibration sensor when the assembly supports the mounting points and left to vibrate in free space. In the system we will be using a vibrating sensor to find vibration from ATM machine when ever robbery occurs.Whenever the sensor triggers ,then the controller activates the automated door locking system and the culprits are lock inside then the venom gas leakage brings the thief into unconscious stage.At that instant,the message alert will be send to the concerned officials through the GSM module and the around the nearby region or locality. In another case ,If the robbers uses hammer or any other mechanical device to steal the cash inside the third layer of the ATM machine,it provide high voltage electrical shock for the robbers who is instantly electrocuted.The third locker generally consists of 800V supply to prevent the cash from robbers.



**Fig.12.Experimental Setup**

## CONCLUSION

As we all know, Now-a days most of the ATM has been attacked by the looters. This project "ENHANCED SURVEILLANCE SYSTEM FOR ATM LOOTERS USING PIC MICROCONTROLLER" reinforces the security features of ATM when compared to the previous system. In this paper, the ATM kiosk has been

monitored by using smart sensor and GSM technology. The entire system will be done by using Embedded system which makes the system more safe, reliable and easy to use. Thus the proposed system enhances the security of ATM against physical attacks and alerts concerned officials to take necessary action at any time and save the people from the ATM violation.

## REFERENCE

- [1]. William H. Yeadon, Alan W. Yeadon. Handbook of small electric motors. McGraw-Hill Professional, 2001.
- [2]. Karki, James (September 2000). "Signal Conditioning Piezoelectric Sensors" (PDF). Texas Instruments. Retrieved 2007.
- [3]. "GSM UMTS 3GPP Numbering Cross Reference". ETSI. Retrieved 2009.
- [4]. Herman, Stephen. Industrial Motor Control. 6th ed. Delmar, Cengage Learning, 2010, 251.
- [5]. Arjun Kumar Mistry, Suraj Kumar and Vicky Prasa, "Secured Atm Transaction Using Gsm", International Journal of Electrical and Electronic Engineering & Telecommunication, 2(3), 2013.
- [6]. M. Raj and Anitha Julian, "Design and Implementation of Antitheft ATM Machine using Embedded Systems," International Conference on Circuit, Power and Computing Technologies [ICCPCT], 2015, 1-5.