

# ATM Vault Authentication & Security using Finger Print Biometric with GSM Technology

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*Abstract*— Security and Authentication of individuals is necessary for our daily lives. Access control systems restrict access to a secured premise or other secured devices (like a safe) only to authorized persons. In this design a biometric (fingerprint based) ATM vault was developed with GSM technology. There are other methods of verifying authentication through password, RFID but this method is most efficient and reliable. To provide perfect security to the bank lockers and to make the work easier, this project is taking help of two different technologies viz. EMBEDDED SYSTEMS and BIOMETRICS. Unauthorized access is prohibited by designing a system that stores the fingerprints of one or more authorized users. Fingerprint is sensed by sensor and is validated for authentication. If the fingerprint matches, the door will be opened automatically otherwise the buzzer will be activated so that the people near the surroundings will get an alert. A survey showed that there is no proper security in withdrawing cash from ATM's. There are no proper authentication methods applied for security during ATM transactions. In this paper, security approaches of ATM have been focused on, and have been improved using biometric based authentication technique i.e. Fingerprint recognition. One of the main motive of biometric ATM machine is to prevent unauthorized access means everyone cannot access the ATM means user should present then the access the ATM otherwise not access the Account. The use of biometric in ATM machine for the purpose of security. Biometrics technology is rapidly progressing and offers attractive opportunities. In recent years, biometric authentication has grown in popularity as a means of personal identification in ATM authentication systems. The prominent biometric methods that may be used for authentication include fingerprint, palm print, handprint, face recognition, speech recognition, dental and eye biometrics. In this paper, a microcontroller based prototype of ATM cashbox access system using fingerprint sensor module is implemented. An 8-bit PIC PIC18F4520 microcontroller developed by Microchip Technology is used in the system. The necessary software is written in Embedded C and the system are tested.

**Key words:** Automatic Teller Machine, PIC18F4520 microcontroller, GSM, SMS, Administrator, Finger print recognition, Liquid Crystal Display

## I. INTRODUCTION

In today's technically advanced world, autonomous systems are gaining rapid popularity. As the social computerization and automation has been increased and the ATM and credit card has been installed and spread out to simplify the activity for financial activity, the banking activity has been simplified, however the crime related with financial organization has been increased in proportion to the ratio of spread out of automation and devices. Among the crime for financial organization, the cases of theft and robber have

very high proportion of over 90% and the crime for the ATM has been increased because the external ATM has been increased and it is always exposed to the crime.

Therefore, this study is going to suggest the method of rapid reaction and minimization of loss by detecting the ATM machine at real-time when it has been stolen can be found through GSM technology. In South America, there are companies that have introduced fingerprint technology as an embedded part of ATM systems, where citizens have already started using fingerprint in place of PIN or Password for general identification with their ID cards. Bank has already been moved to smart cards and now is the time to implement biometric authentication approach in ATM systems.

It is a kind of biometric that is very much secure as every person's finger print scan is unique and cannot be forged easily. Even the identical twins have different finger prints. It is the oldest biometric used. It is said that fingerprints of a child starts to develop when the child is inside the mother's womb. That's why they are unique.

Finger prints have unique patterns and characteristics. They are made up of lines and spaces. Lines are called ridges and spaces between ridges are called valleys. Finger prints also have three types of patterns-arches, loops, whorls. Arch is a pattern where ridges enter on one side of a finger and exit on the other side. Loop is a pattern that enters and exit on same side of finger. Whorl swirls around the central point called core. Finger print ridges have three types of features: - ridge endings, short ridges and bifurcations.

## II. LITERATURE REVIEW

Vinay Chada designed a Microcontroller Based Access Control/Security Lock System based on key-codes. He implemented the work using the Motorola 16-pin MC68HC705KJ1 microcontroller, a 4x3 keypad and an external EEPROM memory to store user pins. The system provides means for a user to change his password any number of times using the keypad. Jayanta K. P. and R. N. Das Choudhury in their work interfaced mobile communication with embedded system to prevent/control access to a vehicle ignition system in a work titled an Embedded Automobile Engine - Locking System Using GSM Technology. In the design, an AT89S52 microcontroller was interfaced with a keypad and GSM modem to protect the vehicle from unauthorized access. The car engine can be started only by entering a correct password; entering an incorrect one thrice, the system will deny further access and send an intrusion alert to the owner's mobile via the GSM modem. M. O.Onyesolu and I. M. Ezeani in a paper on ATM (Automated Teller Machines) Security Using Fingerprint Biometric Identifier sought biometric means of accessing ATM machines to replace passwords (key codes) in order to reduce crimes associated

with loss/theft of passwords and vulnerability of users account to cyber-crimes. Amurthy and Reddy also developed an embedded fingerprint system also for ATM security applications. A customer's fingerprint and mobile number are collected while registering an account; whenever he access the ATM machine, placing a finger on the fingerprint module, it automatically generates different 4-digit code and sends it as a message to his mobile phone (through a GSM modem connected to the microcontroller). The code is received by the customer and is entered into the ATM machine.

### III. SYSTEM DESIGN & IMPLEMENTATION

The block diagram of the proposed system and design of independent modules are considered. Figure 1 shows the block diagram of the fingerprint based ATM authentication system. The main blocks of this system are: (i) Regulated Power Supply, (ii) PIC 18F4520 Microcontroller, (iii) Fingerprint Module, (iv) Liquid Crystal Display, (v) DC Motor and Driver Circuit, (vi) Buzzer, (vii) humidity sensor, (viii) temp sensor, (ix) fire sensor.

The power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various application. The components used in the power supply unit are: step down transformer, bridge rectifier, capacitor filter, voltage regulator (IC 7805), 330 Ω resistor and LED. Bridge rectifier is available in IC form (IC DB107). In the present project IC bridge rectifier is used. This device is ideal for use with printed circuit boards. Electronic filters are electronic circuits, which perform signal-processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones. Here a 1000 μF capacitor filter is used. The process of converting a varying voltage to a constant regulated voltage is called as regulation. For the process of regulation we use voltage regulators.

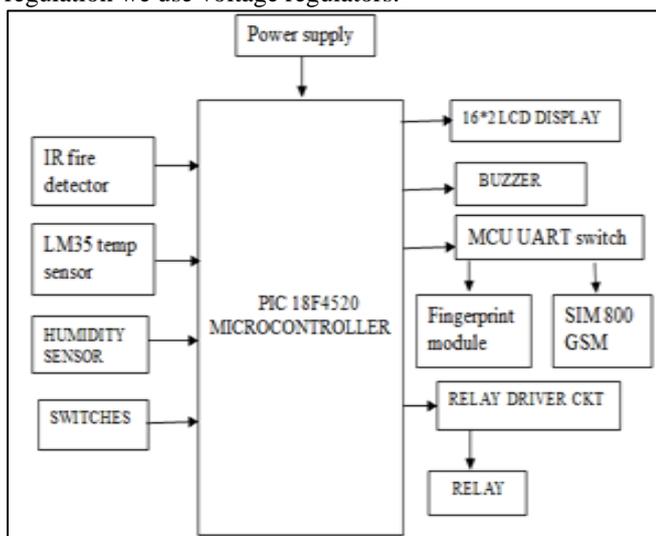


Fig. 1: Block diagram of Fingerprint based ATM VAULT authentication system

#### A. Fingerprint Module

Fingerprint processing includes two parts: fingerprint enrollment and fingerprint matching (the matching can be 1:1 or 1: N). When enrolling, user needs to enter the finger two times. The system will process the two time finger images, generate a template of the finger based on processing results and store the template. When matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. For 1:1 matching, system will compare the live finger with specific template designated in the module; for 1: N matching, or searching, system will search the whole finger library for the matching finger. In both circumstances, system will return the matching result, success or failure.



Fig. 2: Finger Print Sensor (R305)

This is a finger print sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC serial port.

#### B. Fingerprint Library

System sets as idea certain space within flash for fingerprint template storage, that's the fingerprint library. The contents of the library remain at power off. The capacity of the library changes with the capacity of flash, system will recognize the latter automatically. Fingerprint template's storage in flash is in sequential order. Assume the fingerprint capacity N, then the serial number of template in library is 0, 1, 2, and 3...N. The user can only access library by template number.

#### C. GSM

GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in four different frequency ranges. Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. The rarer 400 and 450 MHz frequency bands are assigned in some countries, notably Scandinavia, where these frequencies were previously used for first-generation systems..

GSM uses a variation of Time Division Multiple Access (TDMA) and GSM is the most widely used of the

three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. GSM is the de facto wireless telephone standard in Europe. GSM has over one billion users worldwide and is available in 190 countries.



#### D. GSM SIM 800

##### 1) Technical details:

Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including the United States and Canada) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. The rarer 400 and 450 MHz frequency bands are assigned in some countries, notably Scandinavia, where these frequencies were. In the 900 MHz band the uplink frequency band is 890-915 MHz, and the downlink frequency band is 935-960 MHz this 25 MHz bandwidth is subdivided into 124 carrier frequency channels, each spaced 200 kHz apart.

##### 2) Using GSM Modem in the ATM System:

In the system we will be using a GSM Modem to send and receive SMS. When the robbery occurs, it will send the message to corresponding banks and near police station (PS) according to the controller response.

#### IV. CONCLUSION

As we all know, these days most of the ATM has been attacked by the robberies. 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. The implementation of ATM security by using fingerprint recognition and GSM MODEM took advantages of the stability and reliability of fingerprint characteristics. Additional, the system also contains the original verifying method which was inputting owner's password which is sent by the controller. The security features were enhanced largely for the stability and reliability of owner recognition. The whole system was built on the technology of embedded system which makes the system more safe, reliable and easy to use. By implementing this project we can catch thief and robberies in ATM itself and also we can save our precious time.

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