

## A Review Paper on Improving Security of ATM System

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**Abstract**— Automated Teller Machine (ATM) is an expedient way to access a bank account from anywhere and at any time to perform transactions like cash withdrawal, make deposits & transfer of funds. The ATM has become insecure due to tremendous increase in the number of criminals and their activities. ATM systems today use an access card and Personal Identification Number (PIN) for identity verification. In this paper, security of ATM has been improved by using an embedded system with three levels of securities. First level is access card with PIN; second level is biometric technique and third is One Time Password (OTP). The biometric that we have used is fingerprint. A tilt sensor is also used to alert about the robbery of cash from the ATM. The main motive of these techniques is to diminish and stop the attacks on ATM. The development of such an ATM system would protect consumers and financial institutions from intruders and thieves. In addition to these, the system allows only one nominee user to access the account instead of the main user in case of emergency.

**Keywords**- Biometric ATMs, Embedded System, LPC2148, OTP.

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### I. INTRODUCTION

ATM is an electronic telecommunication device that allows the customers of a financial institution to perform transactions without the need of a human cashier or a bank teller. The ATM is used to perform several banking activities like money transfer, cash withdrawal and credit card payment. Security is a serious issue in ATM system. ATM scams involve thieves inserting a thin, clear and rigid plastic sleeve into the ATM card slot. Due to this the machine is unable to read the strip when the user inserts the card. So it will keep asking you to re-enter your Personal Identification Number (PIN). At that time, the hacker will notice the tap of your finger on the number keys and he can easily guess out the 4-digit PIN [1]. The thieves then remove the plastic sleeve and use the account. The solution to this problem is biometrics.

The proposed system consists of three security levels. First level is access card with PIN. Biometrics provides second level of security. The biometric that we have used is fingerprint. Fingerprint recognition is one of the best biometric techniques as each individual has unique fingerprints. The third level of security used is One Time Password (OTP). As the name implies, OTPs are only valid for one single transaction. OTP makes the system more secure as it expires once it is used. The OTP would be sent on the user's registered mobile number. The transaction would take place only if correct OTP is entered by the user. In addition to these security levels, a tilt sensor is also used that senses the position of ATM. If the robbers try to steal cash from the ATM, the position of ATM would change. Thus the sensor will activate the alarm and lock the door of the ATM center.

### II. EXISTING ATM SYSTEM

The account holder is identified by inserting a plastic ATM card having a magnetic stripe or a smart card having a chip with a unique card number. The card owner needs to remember the PIN and should not share it with others to

prevent unauthorized access to his account [2]. Then the system asks the user to enter the PIN. The received PIN is compared with the PIN from database [3].

The user can access the account only when entered number matches with the number stored in the system. If there is a mismatch, the user authentication process fails and the user is given two more opportunities to enter a correct PIN. If an incorrect PIN is entered for the third time, the card gets blocked. The user can use the several services offered by ATM after he is granted access. A message is sent on the user's mobile after completion of every transaction.

### III. PROPOSED ATM SYSTEM

The enrollment process consists of storing the customer's as well as a nominee user's fingerprints and mobile numbers in the database while opening the account. In this embedded system, the RFID reader would read the user's RFID card. Then the system will ask the user to choose user type. After that it asks for PIN. This entered PIN would be matched with that in the database. If valid then an OTP would be sent on the user's mobile number. If invalid PIN is entered then the user would be asked to re-enter the PIN. After three attempts the card will be blocked. After the level 1 security, the system will take the fingerprints of the user through the fingerprint sensor. The input fingerprint will be matched with the template stored in the database. If the fingerprints match, the user can select the service he or she wants to avail. If the fingerprints do not match, the card is rejected. After the level 2 security, the user will be asked to enter the OTP before the final transaction takes place. If valid OTP is entered, the transaction takes place, if not then the process gets cancelled.

Apart from this when the robbers try to steal cash from the ATM, the position of the machine will change and LPC2148 will get signal from the tilt sensor. It will activate the alarm and lock the door of the ATM center.

Fig.1 shows the block diagram of proposed ATM system.

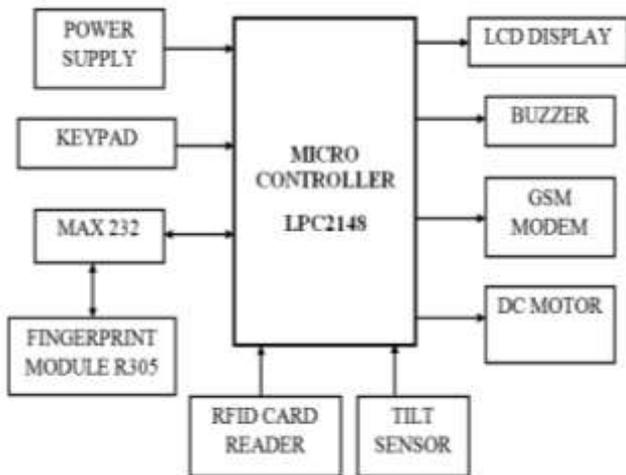


Fig.1: Block Diagram of Proposed ATM System.

### A. Hardware Specifications

#### 1. LPC2148 Development Board

LPC2148 Development Board from NXP semiconductors founded by Philips is used. It is based on ARM7TDMI microcontroller powered by USB port. Some of its key features are 512kB on-chip flash program memory, In-System/ In-Application Programming (ISP/IAP) via on-chip boot-loader software, Serial interfaces include two UARTs, Upto 45 of 5V tolerant general purpose I/O pins, On board peripherals include USB2.0 interface, L293D DC motor controller and 16X2 characters LCD [4]. Fig.2 shows LPC2148 Development Board [4].



Fig.2: LPC2148 Development Board

#### 2. EM-18 Reader Module

EM-18 Reader Module [5] shown in Fig.3 works with any 125 KHz RFID tag. It has a range of 10cm. This module is connected to LPC2148 via RS3232 serial to parallel converter.



Fig.3: EM-18 Reader Module

#### 3. R305 Fingerprint Module

Fig.4 shows R305 Fingerprint Module [7] is used to get user's fingerprint. It has template size of 512 bytes and uses matching method 1:1 or 1:N. It stores and compares the fingerprints [6]. This module is connected to UART1 of LPC2148 via RS232.



Fig.4: R305 Fingerprint Module

#### 4. GSM SIM900A Modem

Fig.5 shows GSM SIM900A Modem [9] is used to send 4-digit OTP on user's registered mobile number. It has Configurable baud rate, SIM card holder, antenna, built in network status LED and onboard regulated power supply [8]. It is connected to UART0 of LPC2148 via RS232.



Fig.5: GSM SIM900A Modem

### 5. 3 MM Mercury Switch Tilt Sensor

Fig.6 shows 3 MM Mercury Switch Tilt Sensor <sup>[10]</sup>. It is used for sensing the position of ATM. There is a ball in the can which makes contact with the pins when the case is upright. The ball doesn't touch the pins when the case is tilted and the buzzer turns on.



Fig.6: 3 MM Mercury Switch Tilt Sensor

#### B. Software Specifications

##### 1. KeilµVision4 software

This system is programmed in embedded C language using KeilµVision4 software. Fig.7 shows the flow chart of proposed ATM system. All the C files and the header files related to the project are stored in a single folder. Keil software includes C/C++ compiler, linker and also a HEX file generator. After compiling the files, a .hex file is generated. Compile the files again and then right click on Target 1 to open option for target 1 in the project explorer window. Go to User tab and select the Run#1 checkbox in After Build/Rebuild. Now enter the command, fromelf.exe --bin --output=any\_name.bin "complete file path of .axf file of the Keil project".

##### 2. Flash Magic software

This software is used to burn the .hex file of the Keil project. The other way is to burn only the boot loader program in LPC2148. The advantage of using boot loader mode is that the PC detects LPC2148 development board as a mass storage device. Thus there is no need to burn the application program in the lpc2148 using flash magic every time.

##### 3. USB secondary ISP Boot loader

After successful installation of drivers, a disk drive will be created in My Computer. Open the drive and a single file labeled as "Firmware.bin" will be present. Now delete that file. Copy the .bin file that was created earlier using Keil and paste it in this drive. Then press reset button on the development board and the program will be executed. To update the firmware or load another code, keep SW1 pressed and then press reset button on the LPC2148. It enters the boot loader mode and creates a disk drive in My Computer and follow the above process again.

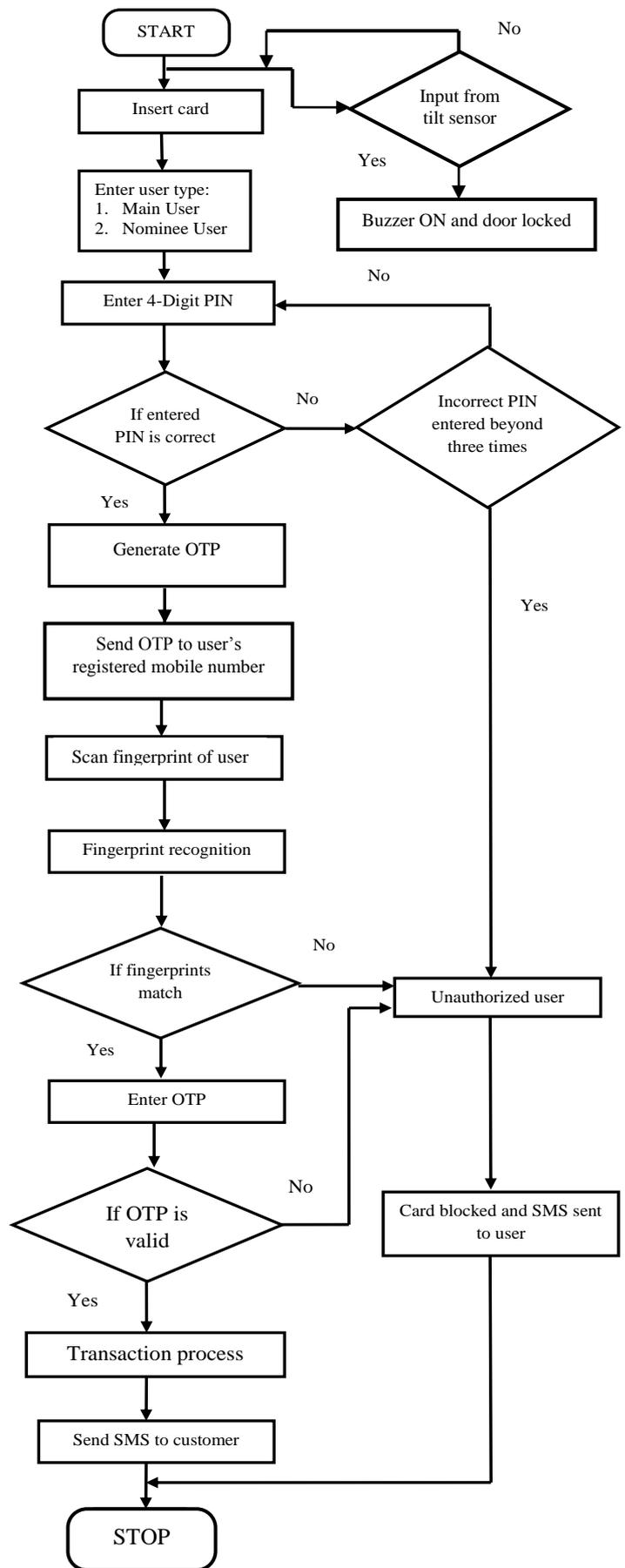


Fig. 7: Flow chart of Proposed ATM System.

TABLE I: Comparison of Existing ATM System and Proposed ATM System.

Technique	Existing ATM System	Proposed ATM System
1. PIN (Personal Identification Number)	✓	✓
2. Fingerprint Recognition	NA	✓
3. OTP (One Time Password)	NA	✓
4. Tilt Sensor	NA	✓

So the proposed ATM system provides three levels of security measures as compared to that of existing ATM system.

#### DISCUSSION

The existing ATM system takes 3-4 minutes for the transaction but is insecure due to tremendous increase in the number of criminals and their activities. Instead, the proposed ATM system requires more time for transaction than the existing ATM system but provides immense security due to fingerprint recognition and OTP. So we have to compromise with time for the sake of security.

Thus the proposed ATM system works with only the authorized ATM card holder and one nominee user to access the account instead of the main user in case of emergency. This system can be implemented firstly at small industries and institutions with 100 workers.

#### CONCLUSION

The current ATM system needs only PIN for cash transactions. It is insecure if any unauthorized person gains access to PIN. Thus in our proposed system, fingerprint recognition and OTP are used to improve security level. Fingerprint recognition is used as a biometric technique

because every individual has unique fingerprint. It is also unique across fingers of the same individual. OTP is a numeric password that is valid only for one transaction and is generated based on the current time. In addition to these security levels, a tilt sensor is also used that will activate the alarm at the ATM center and lock the door if the robbers try to steal cash from the ATM machine. Thus the overall security of the ATM system is improved. A nominee user can also use the ATM in case of emergency.

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