RFID Based Real Time Password Authentication System for ATM

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Abstract—The existing ATM systems uses one magnetic card & a static PIN. Hence the security of present system is vulnerable as security of such systems can be breached by skimming devices, card trapping etc. The proposed system introduces transaction authentication code (TAC) which is dynamic 4 digit secret code generated during transaction in addition with static PIN and send it to user’s cell phone no. Here unless entered code by the user as well as generated code is matched the transaction doesn’t get completed. This system is realized using LPC2148 which is a series controller of ARM 7 & peripherals like GSM module & RFID systems. Proposed system is complex and hence provides better security than systems before.

Key words: ATM, ARM7 LPC2148, TAC, GSM Modem, LCD, RFID Cards and Reader, Keypad

I. INTRODUCTION

Automatic teller machine is used for checking balance and withdrawal of money from bank account. In earlier days there was only one option for bank customer’s to stand in long queues in the bank for withdrawing money and to check account balance; which is difficult in some level and also time consuming. But today ATMs are widely used without the need of human teller, customer can check their account balance and withdrawing money with no need to go to the bank and ATM also offers 24 hours service for customers. The existing ATM system uses a bank ATM card (Magnetic card) and a PIN which is fixed, a customer swipe magnetic card and after that enter a PIN then transaction of money will be done. A magnetic card is used for to identify a user, which is not secure because the attacker can place a skimming device over the swiping machine of magnetic card. By this the information which is stored in that card can easily get copied in that skimming device. Bank provides a PIN to customer for accessing account that PIN is fixed in nature so attacker can steal customer’s card and PIN by shoulder surfing, data skimming and card trapping. So there are increasing financial crime cases in ATM transaction. Various proposed work done with the help of biometric identification, as biometric is most secure way of identification which verifies an individual through the various characteristics like iris, voice, palm print, face, finger prints . But it requires more storage space which increases the cost of the system [9]. In this paper to overcome the limitations of magnetic stripes and biometric authentication RFID card is used with TAC for secure ATM transaction.

II. LITERATURE REVIEW

We have studied various related works to implement this concept and found the following information.

Ugochukwu Onwudebelu [1] proposed an ATM system with mobile phone text message as a SMS based hashing scheme, here customer send mobile phone text message as an alert message to bank for transaction process. Then Bank generates a hash code with the help of PIN and phone number. Here security increases, but the proposed system required two way communications because of three mandatory SMS message for complete process which increase the communication charges.

R. Rasu [9] Here author’s used Finger biometric, Iris and Face recognition method for security of ATM. By using biometric authentication the system gets more costly and also storage space for biometric data.

Ankush Vishwanath [2] proposed a security system with the help of RFID and GSM. They used a RFID card with unique number to identify a user, after reading card system will send a password to user’s cell phone through GSM. Here access will be done after entering combination of password with unique code, but here user has to enter a password and unique code in combinable form which is not easy for every user and they also used that system for security purpose only.

Fadi Aloul [3] proposed a mobile phone based software token system. They used two authentication system, first in which client’s mobile and server both will generate one time password and if both OTP matches then authentication will be done. In second method client will send SMS to server for OTP, then OTP will be send by the server to the mobile phone of user. Here a two way communication is required between both client and server, and also OTP generation software is required on client’s mobile phone which is not possible for every user.

So this paper try to overcome these limitations by using RFID cards, TAC, one way communication and with simple and user friendly system.

III. HARDWARE DESIGN

The following Fig. 1 shows the various components of ATM system. The LPC2148 is used which is a series controller of ARM7 family. The ATM system consists of power supply for LPC2148, 125KHZ RFID card and reader for reading the data of the RFID card, memory is used for creating the database, keypad for entering PIN and TAC, LCD is used for displaying the information, and a GSM modem is used for sending a TAC to the user’s cell phone. Here GSM modem and RFID reader both are connected to the controller with the RS232 interface.
Radio frequency identification (RFID): RFID is used for the purpose of identification and tracking [8] with the help of radio waves. It is advance contactless identification technology. In RFID radio-frequency waves are used to transfer data between readers and tags to identify, track and categorize. There are three primary frequency bands are used for RFID Low Frequency (125/134 KHz), High Frequency (13.56MHz) and Ultra high Frequency (850 MHz to 950 MHz) [7]. RFID system consists of three main components are as follows.

1) RFID tag
2) RFID reader
3) Backend database server.

B. RFID Tag:
RFID tag is a small electronic device in which small antenna and a microchip is present, where chip is used to store a unique identification number and product information. Microchip is an integrated circuit, which is embedded on silicon chip. Mainly there are two types of RFID tag such as active and passive [6]. Active tag contains their own power source an on board battery is present in active tag and because of their on board power source, active tag operates at higher frequency and also they are expensive [7]. Passive RFID tag get power source from reader, operating at lower frequency and read range of passive tag is less than active tag [8].

C. RFID EM 18 Reader Module:
It is used for reading the RFID tag. Basically it works as a transponder which sends and receives radio signals. The EM 18 RFID reader module comes with an on chip antenna and can be power up with a 5v power supply. It operates at a frequency of 125 KHz. The transmit pin of the RFID reader module is connected to the receive pin of LPC2148 IC. When a RFID card is brought near to the reader it produces a beep sound and a LED turns ON. The read distance of this RFID card is 5cm and it reads only one card at a time. The Fig 2 shows the principle of RFID system in which the antenna within a reader generates electromagnetic field and transfers the energy signal to the tag with the help of radio waves [6]. Then tag will received that energy signal and store charge in a capacitor in this way tag get the power from the energy signal [8]. When the capacitor has built up enough energy, tag will transfer the data to words the reader in encoded form using radio waves and then reader decode the data and data will be stored in the backend database server for further processing.

D. LPC2148:
In this system we are using LPC2148 IC from ARM7 family from NXP semiconductors (founded by Phillips). It is the series controller of the ARM7 family which is an Advanced RISC Machine (ARM). It is a 32 bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. It has 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory, two 32-bit timers or external event counters, two UARTs [11]. In LPC2148 IC CPU operating voltage ranges from 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads which is uses low power consumption. In this two power saving modes are available which are power down and idle. Here on-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz; hence speed of this IC is 60 MHz which offers high performance. Here up to 45 of 5V tolerant fast general purpose input output pins are also available.

E. GSM Modem:
GSM is a Global System for Mobile communication (GSM) and it is globally accepted standard for digital cellular communication. It is a wireless modem which works with a GSM wireless network. It supports wide range of frequencies and also supports integration with RS 232cable, provided with SIM holder [12]. It is programmed with AT commands, here we have used SIM 300 GSM modem for sending TAC as a SMS messages and to monitor the signal strength in particular locality.

F. Power Supply:
In this system the power supply consists of a transformer to step down followed by diodes. The diodes are used to rectify the ac components to dc, after rectification process the obtained rippled dc is filtered using a capacitor filter. The positive voltage of 5V is made available through LM7805. After that LM 317 is used to provide power 3.3V.

G. LCD and Keypad:
Here we have used a 16*2 LCD for display purpose. It is sufficiently wide to serves the purpose of an ATM display screen. It operates at a 5V dc. The keypad that we have opted for is a 4*3 matrix keypad. The rows and columns are connected to GPIO ports of the LPC2148 IC. It is used to enter PIN and TAC in this system.
IV. METHODOLOGY & WORKING

To implement this system firstly designed a circuit diagram with the help of Proteus software in which LPC2148 IC is connected with all the components after that same design is used to design PCB layout. Then connecting all the hardware components with controller IC, programming is done with the help of keilμ vision 5 [13]. The program is burn into the LPC2148 IC using Flash magic software. In this system user must have to register with his cell phone number at the time of registration. In this ATM system three RFID cards are used.

Firstly user have to place a card near a RFID reader, reader will read the card information if the card is authorized then LCD will display message shown in Fig. 3.

Steps to be followed by the user.
1) Place a card near a RFID reader shown in Fig. 5.

![Fig. 5](image)

2) LPC2148 validates that card and LCD will display a message to enter PIN within 30 sec refer Fig. 6.

![Fig. 6](image)

3) Now controller will randomly generate TAC which is dynamic 4 digits secure code.

4) Then controller sends that TAC to the user’s cell phone number as a SMS through GSM modem shown in Fig. 7.

![Fig. 7](image)

5) When this TAC is entered by the user within 30 sec shown in Fig 8 then and only then LCD will display a menu on screen.

![Fig. 8](image)
6) Finally user can check his account balance, can credit money into his account, debit money from his account and etc shown in Fig 9.

![Fig. 9](image)

7) After performing one operation the system will automatically exit from the menu.
8) Then a confirmation message with balance information is send to the user’s cell phone number shown in Fig. 10.

![Fig. 10](image)

The Fig. 11 shows the overall programming logic of the ATM system and Fig. 12 shows the ATM system setup and connection.

![Fig. 11: Flowchart of ATM System](image)

![Fig. 12: ATM System Setup and Connection](image)

V. CONCLUSION

Today, single factor for authentication like PIN is no longer considered secure in ATM. Because of easy to guess password, there are increasing financial crime cases for ATM users. The RFID based real time password authentication has been used to meet the demand of organization for providing stronger authentication options to ATM users.

This paper focused on the implementation of RFID and TAC based real time password authentication method using cell phone. As RFID technology is emerging technology which can be used in wide range of application. Here both RFID and TAC are integrated, as TAC should be entered by the user for successful transaction. This system is suitable for several practical applications like user identity, security purpose and prevention from ATM frauds. Thus this system ensures to solve the aspect of ATM security to a larger extent due to the use of cell phone service. This system works at lower power as LPC2148 is used, and compact in size, less maintenance requires and also it gives easy control, time saving, reliable and user friendly.

REFERENCES


