

Arduino Based Bank Locker Security System Using RFID and GSM

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ABSTRACT: The main aim of this paper is to design and implement a highly secured locker system based on Radio Frequency Identification (RFID) reader, Global System for Mobile (GSM) modem, Arduino AT mega2560 board which can be used in bank, secured offices and homes, etc. The proposed system is a Dual-band GSM/GPRS module SIM800A that works with the frequency of EGSM 900MHz and DCS 1800MHz. By using this system, only the authenticated person can withdraw money from the locker. RFID is used to identify a person or an object by using Radio Frequency transmission which is a compact unit and has built in antenna and can be directly connected to the computer(PC) using RS232 protocol. The operating voltage of RFID is 5v and the operating frequency 125 KHz. The readable distance of RFID is upto 10 cm. The arduino program is written in embedded C and compiled using Arduino IDE. The version used is Arduino IDE 1.8.8 launched in 2018. AT mega 2560 is running at a frequency of 16 MHz with an auto-reset.

KEYWORDS:GSM, RFID, Arduino

I.INTRODUCTION

Nowadays, safety and security has become a major issue for most of the people living in the rural and urban areas. To reduce the security threat, most of people will use alarm systems. We usually forget to carry the key of our bank locker. In these cases, it is really difficult to open the locker. The main concept of this paper is a bank locker opening system using two passwords that entered through keypad. Each and every bank locker will have a GSM module connected to it. When the owner wants to open the locker the user has to send a password through SMS. Then the microcontroller connected to the GSM module reads the password. If the contents are correct then it will enable the keypad to enter the second password. Then the user has to enter second password using keypad. If the second password correct then the system allows user to access the locker. We have a dc motor which will operate when both passwords are correct. Buzzer will be turned on if any one of the two passwords is wrong. Then the microcontroller sends SMS to the user both the wrong SMS as well as the correct password.

II.RELATED WORK

In this area some of the related works are done by connecting the GSM with arduino for security purpose are illustrated. In [1], A Prepaid Water Meter System for prepaid billing of water usage via faraway tracking which does not require human work has been evolved. This system may be fast and reliable billing of water and also it prevents any misusing of the system. However, [5] development of a water meter reader using GSM module has lead to monitoring of water meter reading before any billing process in remote places. This might reduce the involvement of human resource for reading the meter and producing a bill. A work to monitor an electrical meter reading using GSM network is explained by [6]. The system was able to monitor the meter reading and send an SMS to the official center for billing. When the authorized person is unable to reach the RFID reader RS232 meter, the number of estimated reading is reduced. In [7], the system is used to control home appliances continuously and provide security when the owner is away from the place. The similar work is presented in [8] which involve designing and development of a smart home system. The system allows the user to monitor and

control the home appliances through a mobile phone by sending instructions in the form of messages and receiving the status of home appliances.

III. PROPOSED METHOD

In this paper, the RFID reader reads a data from tag and it also send to the microcontroller. If the card is authentic then display shows the eight digit number of the card read by the microcontroller. Then the authenticated person needs to enter the password by the keypad, if the password is valid then microcontroller sends the SMS to account holder's mobile number. Then the person enters the second password to the microcontroller through keypad and compares the passwords entered also the received SMS (OTP). If these passwords match, the microcontroller provides necessary control signal to open the bank locker. This method is simple and more reliable than other system.

A. RFID

RFID" means Radio Frequency Identification. An RFID reader is a device that is used for examining an RFID tag. The reader emits radio waves as the tag responds by reversing their data back. An RFID tag is a microchip merged with an antenna. This package is built to allow the RFID tag that is attached to an object to be traced. The RFID tag's antenna collects the signal from an RFID reader and then returns the signal to the RFID reader, generally by providing some additional data. RFID tag is a submissive tag that does not contain a battery where the reader imparts power. When radio waves from the reader are experienced by a submissive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag drives power from it, exciting the circuits in the tag. The tag then sends the information ciphered in the tag's memory. The receiver and transmitter pins of RFID reader connected to transmitter and receiver pins of ATMEGA2560 Microcontroller eventually. Then, the reader senses the information from the tag and sends the sensed information to microcontroller via serial port.

B. GSM

The GSM modem is a special type of modem. GSM accepts a SIM card that works on a subscriber's mobile number over a network, just like a mobile phone. GSM is basically a mobile phone without display. Modem sim800 is a tri-band GSM/GPRS engine that works on EGSM900MHz, DCS1800MHz and PCS1900MHz frequencies. GSM Modem is RS232-logic level compatible. It takes negative voltage (-3v to -15v) as logic high and positive voltage (+3v to +15) as logic low. Conversion of TTL into RS232 logic level translator between the microcontroller and GSM board is done by MAX232. The microcontroller signal at pin 11 is sent to the GSM modem through pin 11 of MAX232. Then the signal of pin 11 is received at pin2 (RX) of the GSM modem. The GSM modem transmits the signal from pin3 (TX) to the microcontroller through MAX232, which is received at pin 10 of IC1.

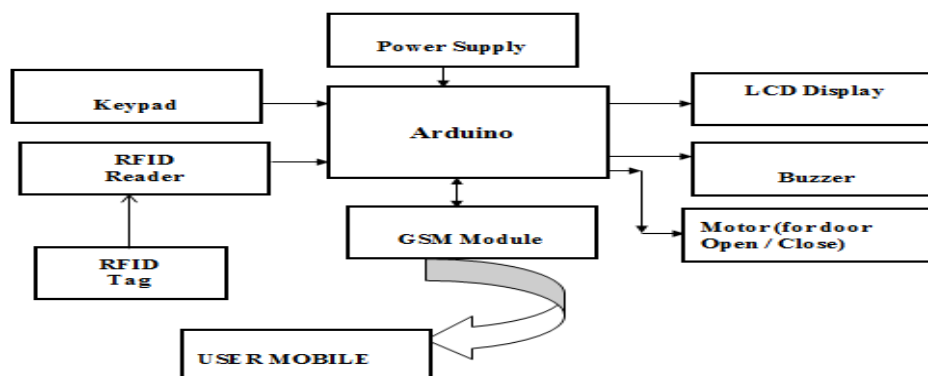


Figure 1: Block diagram of Proposed System

The block diagram of Bank locker system based on RFID and GSM technology is shown in the figure 1. It consists of the power supply section, keyboard, RFID Reader, ATMEGA2560 microcontroller, MAX232driver, GSM modem and LCD. The GSM board has a valid SIM card with sufficient recharge amount to make outgoing calls. The circuit is powered by regulated +5v dc.

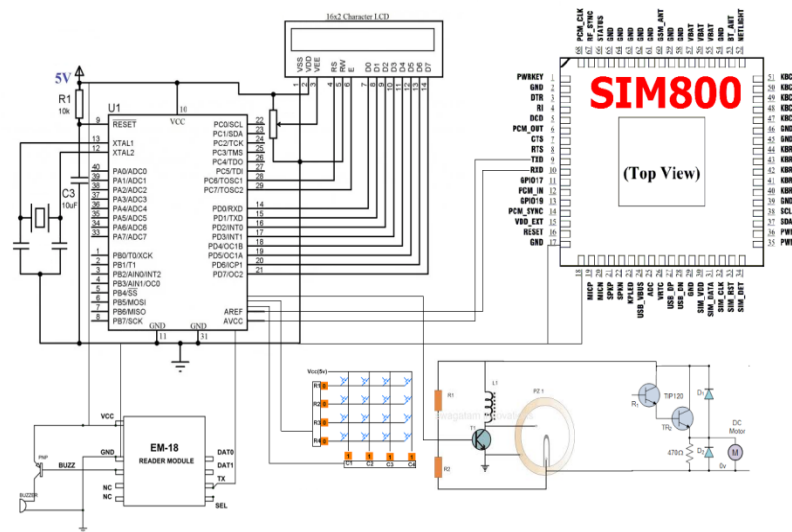


FIGURE 2: CIRUIT DIAGRAM OF PROPOSED SYSTEM

In this paper, first RFID Reader read the customer RFID tag number then OTP Password sends to registered mobile number using GSM Module and also PIN and OTP number is entered using the matrix keypad , everything is correct the door is opened , otherwise buzzer is enabled and message sends to customer. The Figure 2 of proposed system is achieved by designing an embedded system, which consists of embedded controller, Keypad, RFID module (Radio Frequency Identification) and GSM module. Embedded controller used here is ATMEGA 2560 micro controller. Keypad is used to enter password. GSM module provides communication between user mobile and bank. Here keypad is interfaced I/O lines of micro controller RFID module and GSM module are interfaced with serial port of micro controller. User who wants to do access the bank locker provided with Individual RFID tag. When user accesses the banking they show their RFID Tag. RFID reader reads the information from the tag. The micro controller is programmed to receive the RFID tag data from RFID reader and compares this data with already stored authorized data in micro controller. If it matches, it sends a password (OTP) to user's mobile phone. Then user enters the password through the keypad. Finally micro controller sends the details to user mobile through GSM module. If password is incorrect buzzer is enabled and message send to customer.

C.ARDUINO SOFTWARE

The software program is written in embedded C and compiled using Arduino IDE. After compiler operation the hex code is generated and stored in the computer. The hex code of the program is burnt into the AT2650. The version used is Arduino IDE 1.8.8 lunched in 2018. AT mega 2560 is running at a frequency of 16 MHz with an auto-reset. It has improved level of automatic port re-selection after upload. The MacOSX added a touch bar support and does not exit the application after closing last window.

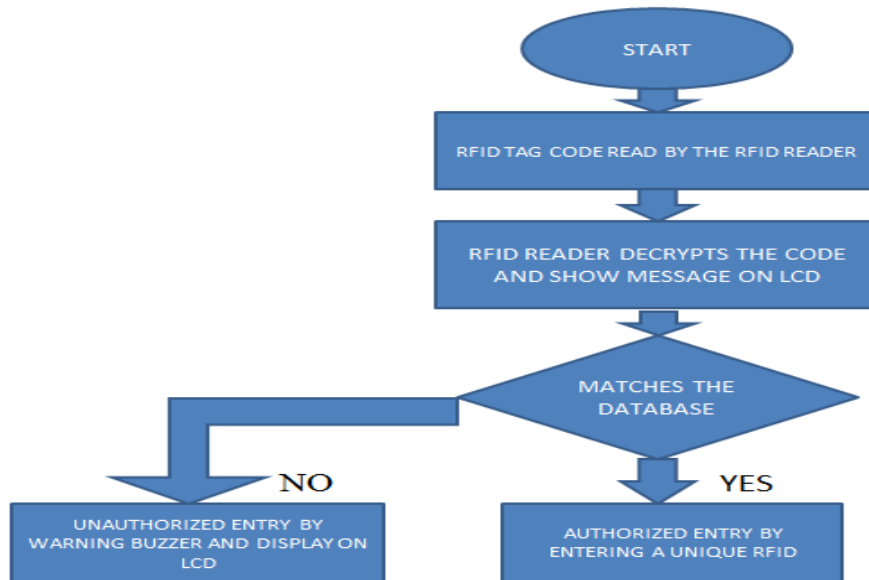
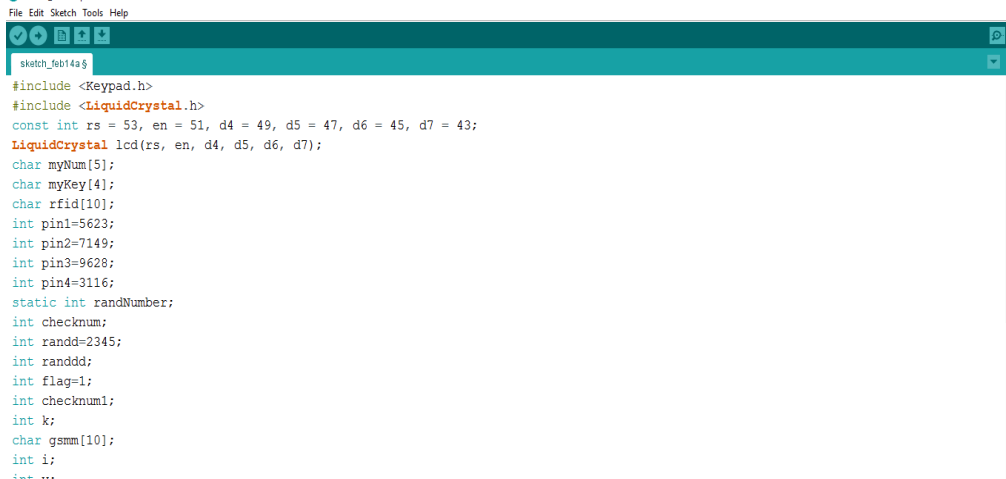


Figure 3. Flow chart of the proposed system

D.ALGORITHM

- Start the program
- The LCD display is on
- The RFID reader reads the code from the RFID tag
- Then the 4 digit OTP is entered using the keypad
- If the OTP is correct then it further asks to enter the password
- If both the OTP and password is matched then the DC motor is on indicating that locker can be opened
- If any one of them is wrong or mismatched buzzer is on which indicates unauthorized entry



```

sketch_feb14a$
#include <Keypad.h>
#include <LiquidCrystal.h>
const int rs = 53, en = 51, d4 = 49, d5 = 47, d6 = 45, d7 = 43;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
char myNum[5];
char myKey[4];
char rfid[10];
int pin1=5623;
int pin2=7149;
int pin3=9628;
int pin4=3116;
static int randNumber;
int checknum;
int randd=2345;
int randdd;
int flag=1;
int checknum1;
int k;
char gsmm[10];
int i;
int ...
  
```

Figure 4. Program for proposed system

IV. EXPERIMENTAL RESULTS

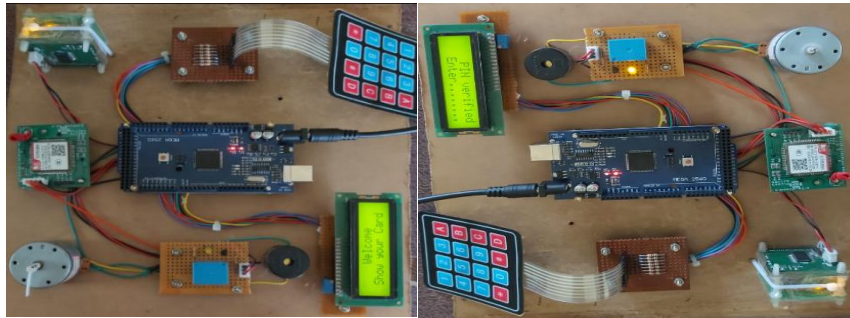


Figure:5. (a)

Figure:5. (b)

When the experimental setup is on the LCD displays “Welcome Show your card” as shown in figure:7(a). When the card is shown the data from the RFID tag is read by the RFID reader, the LCD shows the eight digit data for example “Card ID:11812208”. Then a message containing a four digit number (OTP) is sent to the account holder’s mobile. If the OTP is correct, then LCD displays “enter PIN”. If both the OTP and the PIN number is matched the display shows “PIN verified” as shown in figure:7(b) and the motor is on indicating that the locker can be opened. The buzzer is on when the entered OTP is wrong or when the PIN number is wrong and even when there is a mismatch between the OTP and PIN number and the display shows “wrong OTP or PIN Try again”.

V. CONCLUSION

This paper implements a Bank locker security system using Arduino, passive RFID and GSM. It is a cheap, low power consumption, compact in size and standalone system. The microcontroller analyses the passwords entered by the keypad and received SMS (OTP) through mobile phone. If two passwords are correct the microcontroller generates necessary control signal to open the bank locker. Buzzer will be turned on whenever the entered passwords are incorrect. Future work of this paper, is planned to develop a security system based on biometric system for identification of the person.

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