

ENHANCED LOCKER SECURITY SYSTEM

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Abstract: Personal security is one of the main concern when it comes to office, banks, home, workplace etc., keeping this in mind we have designed an enhanced security system for lockers where only the authenticated person can recover the things from the locker. The main goal of this project is to design and implement highly secured locker system based on fingerprint, GSM technology and password. We have implemented a three level door locking security system based on fingerprint, which is one of the many forms of biometrics, used to identify individuals and verify their identity and GSM is used to send/receive SMS to/from mobile unit. Finally a keypad is given to enter the PIN(Personal Identification Number).

Keywords: Arduino Atmega 2560, Fingerprint reader, GSM module, Keypad, LCD display, Buzzer, Mobile unit.

1. INTRODUCTION

In present generation, security plays an important role irrespective of the place. Some people are more concern about their safety for their expensive things like jewellery, money etc. So the lockers are the safest place to accumulate them but the conventional security system is not providing the higher security because in conventional security system a user can open the lockers using keys. Sometimes the keys could be stolen. The main aim of this embedded system is to provide efficient security to the lockers using fingerprint, GSM technology and PIN (Personal Identification Number).

2. LITERATURE REVIEW

The study on the relevant papers related to the topic would not have been possible if the researchers did not routinely place their papers on the Internet for public access. Through various sources like books and papers available on Internet, library, digital library relevant papers were surveyed. Some of them are listed below.

K.A. Musale [1]

In this proposed work, the RFID reader reads the data from tag and send to the microcontroller, if the card is valid then microcontroller display the account holder name and number. Then the account holder need to enter the password, if the password is valid then microcontroller sends the SMS to account holder mobile number. Then account holder sends the password to the microcontroller through mobile phone using GSM. The microcontroller compares the passwords entered by keyboard and received through mobile phone. If these passwords are correct the microcontroller provides necessary control signal to open the bank locker. Here there may be the chances of loosing RFID tags.

Atar Narsin [2]

In this proposed work, each locker has separate fingerprint module to open the locker. Users scan their fingerprint. After scanning process completed user enters their password with the help of keypad then their particular locker is open. After the work has been completed if key is pressed again with help of keypad the locker door will be closed again. If an unauthorized person tries to check his fingerprint image then an signal will be given by a buzzer which is interfaced to the controller and also if incorrect password is entered by the user again indication will be given by the buzzer. And using a GSM modem to send the message on mobile of manager.

3. PROPOSED METHOD

It is a three level security system. In level-1, the user need to place his/her finger on the fingerprint reader. It scans and compares the fingerprint with the stored one in fingerprint module itself. If the finger placed is valid one, then it allows to the next level. If the fingerprint is not valid, then it does not allow to the next level. In level-2, user need to send a message (passcode) from the mobile to the SIM present in the locker and it compares with the passcode present in the code. If the passcode is valid, then the system enters into next level. If the passcode is not valid, then the system asks to send the valid message again. If there is no signal coverage or mobile phone is not available with the user, then a security (backup) question would be asked to the user through which user can enter into the next level. In level-3, user need to give the PIN using the keypad. The PIN entered is compared with the stored one in the EEPROM of Arduino. If the PIN is valid, then the door unlocks. If the PIN is not valid, user has three chances of entering the password. If 1 wrong attempt, it ask the user to enter the PIN again. If 2 wrong attempts, buzzer gives a beep sound and it will create a delay and displays a timer of 5min and at the same time an intimation is sent to the owner. If 3 wrong attempts, the locker resets and system starts from the level 1. If the user enters a reverse PIN, then a message will be sent to the POLICE (i.e., location will be sent). Servo motor is used to lock/unlock the door.

4. FLOW CHART

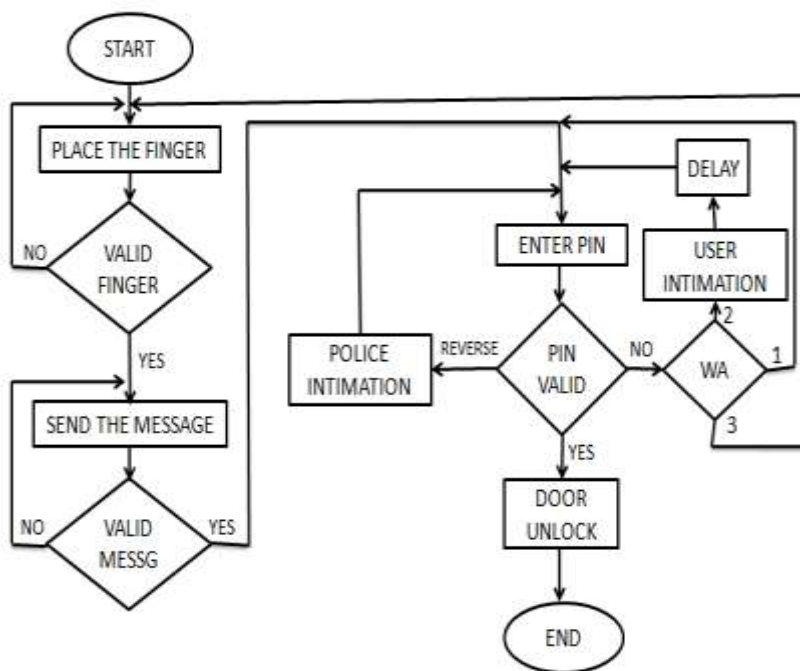


Fig 4.1 Flow chart

5. BLOCK DIAGRAM

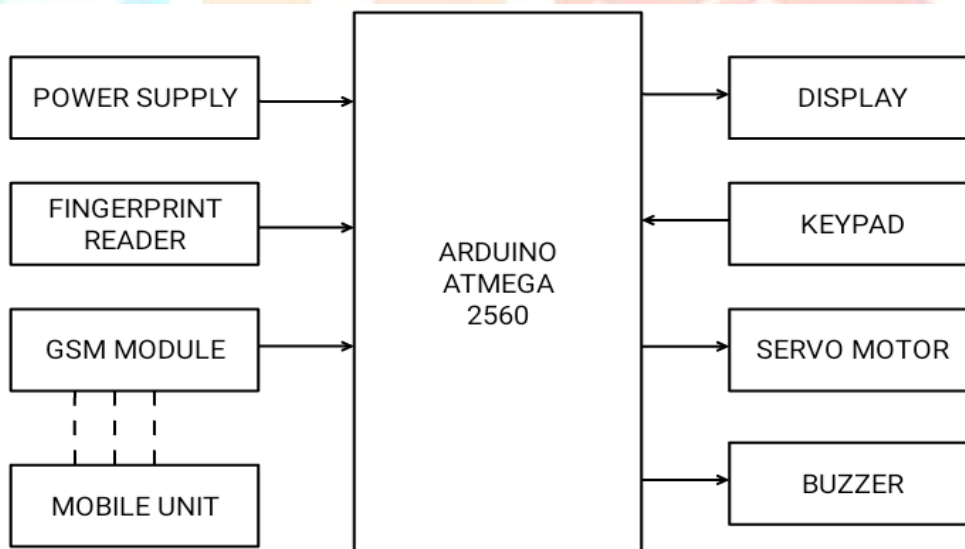


Figure 5.1 Block diagram of Enhanced locker security system

5.1 Arduino Atmega 2560:



Figure 5.2 Image of Arduino atmega 2560

Arduino is an Open-source prototyping platform based on easy to use hardware and software. Because it is so flexible and open source, Arduino is the best solution. The Arduino Mega 2560 is a microcontroller board based on the Atmega 2560. It has 54 digital I/O pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UART's (hardware serial ports), a 16MHz crystal oscillator.

Features of Arduino Atmega 2560:

- High Performance, Low Power AVR® 8-Bit Microcontroller
- Advanced RISC Architecture
- Non-volatile Program and Data Memories
- 64K/128K/256K Bytes of In-System Self-Programmable Flash

5.2 Fingerprint Reader:



Fig 5.3 Fingerprint reader

A scanner/reader is used to identify a person's fingerprint for security purposes. Fingerprints are one of several forms of biometrics, used to recognize persons and verify their identity. The analysis of fingerprints for identical purposes generally requires the similarity of several features of the print pattern. This is a fingerprint sensor module with TTL UART interface. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying someone.

Features of Fingerprint reader:

- Power DC: 3.6V-6V
- Interface: UART (TTL Logic level) / USB 1.1
- Character file size: 256bytes
- Storage capacity: 128
- Window Dimension: 18mm*22mm

5.3 GSM Module (SIM800L):

SIM800L is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, EGSM900MHz, DCS1800MHz and PCS1900MHz. SIM800L features GPRS multi-slot class 12/class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3, CS-4. With a tiny configuration of 15.8*17.8*2.4mm, SIM800L can meet almost all the space requirements in user applications such as smart phones, PDA and other mobile devices.

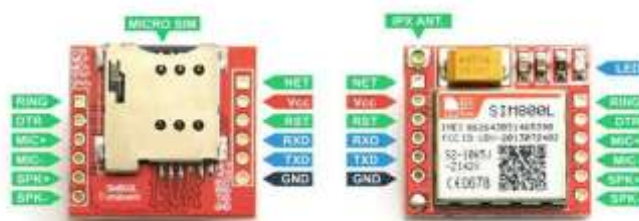


Fig 5.4 GSM Module

Features of GSM Module:

- Supply voltage: 3.4V - 4.2V
- Module size: 25 x 23cm
- Interface: UART (max. 2.8V) and AT commands

- SIM card socket: micro SIM (bottom side)
- Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)

5.4 4x4 Matrix keypad:

Keypad is used to enter the PIN. Here in this project a 4x4 matrix keypad is used. Typically one port pin is required to read a digital input into the controller. When there are a lot of digital inputs that have to be read, it is not feasible to allocate one pin for each of them. This is when a matrix keypad arrangement is used to reduce the pin count. Therefore, the number of pins that are required to interface a given number of inputs decreases with increase in the order of the matrix.



Fig 5.5 Matrix Keypad

Features of matrix keypad:

- Ultra-thin design
- Adhesive backing
- Excellent price / performance ratio
- Easy interface

5.5 LCD (Liquid Crystal Display):

A liquid crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light modulating properties of liquid crystal. A model described here is for its low price and great possibilities most frequently used in practice.

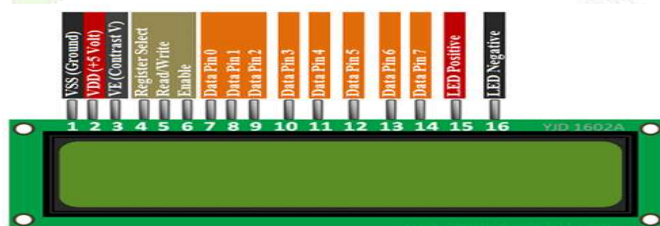


Fig 5.6 16*2 LCD

It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

Features of 16*2 LCD:

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight

- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters

6. RESULTS

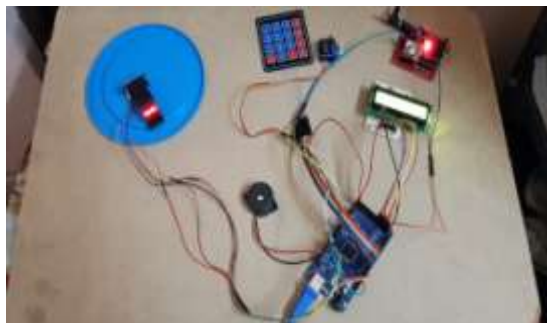


Fig 6.1 Experimental Observation



Fig 6.2 Total image

Fig 6.3 Level-1 image



Fig 6.4 Level-2 image

Fig 6.5 Level-3 image

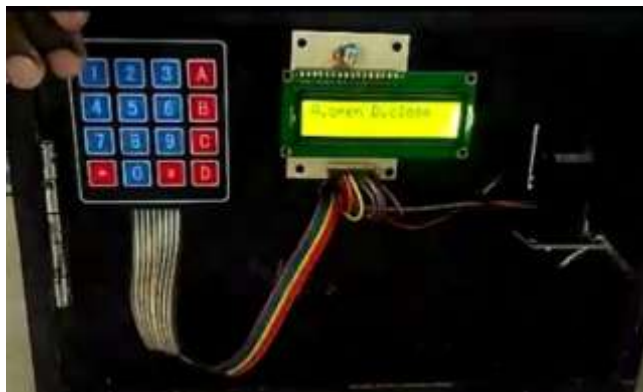


Fig 6.6 Options to open and close the door

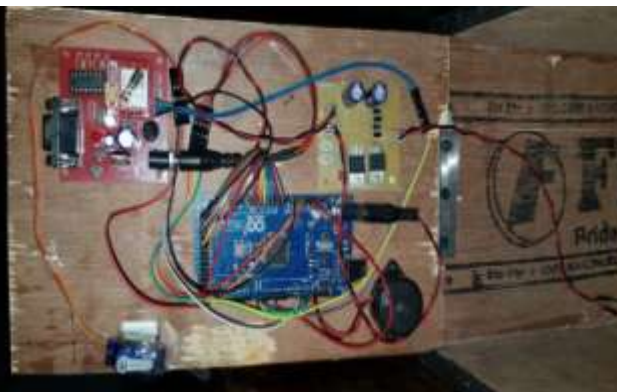


Fig 6.7 Internal circuit connections

7. CONCLUSION

Personal Security is one of the main concern when it comes to office, personal workplace in home, bank etc. In this project, we have implemented a three level security system for lockers so that the valuables can be recovered based on fingerprint, GSM technology and PIN containing door locking system. In this system only authentic person can recover things from locker. Using fingerprint, GSM and PIN, we can authenticate, validate the user and unlock the door in real time for locker secure access.

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