

Development of GSM Based Advanced Alert Home Locker Safety Security System Using Arduino UNO

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ABSTRACT

At present most of the people are facing the problem about how to safeguard their personal belongings like ornaments, important documents and money kept in home due to the theft in houses, offices and in organisations also. Hence, most of the house people are taking almanacs and safeguard lockers in homes to provide security to their important belongings. But even still they operated with manual operation of lock and key system without providing any information to the user when theft is happened by breaking them. Hence, an attempt has been made to develop advanced alert home security system with Fingerprint and Password authentication to open or close the door system and also sending the message if any miss operation will be performed by others using GSM Technology with smart mobile. The present system provides the better security to all kinds of houses and also this system has very economical cost, so that it can be affordable to all. The system successfully developed, implemented and tested in our laboratory and we found that its working is satisfactory.

Keywords: Arduino Uno, GSM, Fingerprint Sensor Module, Multi Segments

I. INTRODUCTION

Security provides protection to our life and valuable assets. Ensuring of safety and security of people and their valuable things in home are very important for avoiding the illegal protection from the intruders by theft which is not safety [1]. At present safety has become an essential issue for most of the people in rural and urban areas. The things will try to cheat or steal the property which may endanger the safety of their belongings such as ornaments, important documents and money in the houses, offices and homes. To overcome this security threat, most of the people will install bunch of locks or closing systems. But at present the robbery will be easily happened due to the mechanical locks which are easily broken over by using advanced tools. Hence, we made an attempt to develop an advanced Home security system with

fingerprint and soft password authentication. And also implementing the GSM Technology for sending alert message about the home locker which will be more secure than others as a low cost system to replace the present procedure as presented in abstract for the operation of home lockers used by the people.

II. LITERATURE SURVEY ON EARLIER WORKS

In this section some related works connected to the security systems with GSM technology are presented as the work describes about the design and implementation of home locker security systems with fingerprint RFID as authentication with microcontroller and PC [2]. R. Ramani et. Al. designed and implemented the home locker security systems based on RFID and GSM technology which

can be organised in home[3]. R. Srinivasan et. al. developed an advanced locker security system based on RFID, password and GSM Technology with automatic movement of locker system [4]. M. P. Manjunath et. al. were developed NFC based locker systems with near field communication. In this work a mobile device having NFC tag with fingerprint sensor is used which will generate a digital pass code by developing real time password generator [5]. Abhishek S et. al. were developed and implemented a home security system with GSM module with microcontroller [6]. Crystalynne D. et. al. were developed locker opening and closing system with RFID, Fingerprint, Password and GSM in [7]. Raghu Ram.Gangi et. al. were implemented microcontroller based biometric locker with short message service systems [8].

III. DEVELOPMENT OF HARDWARE AND SOFTWARE OF HOME LOCKER SECURITY SYSTEM USING FINGERPRINT, PASSWORD AND GSM

The block Diagram of the Home locker security System with fingerprint, soft password and sending alert message with GSM Technology is shown in figure 1 and the schematic diagram in figure 2. The home locker security consists of the mainly following units. They are

1. Fingerprint module
2. Driver Unit and Motor
3. Key pad and Multiplexed Seven segment display
4. GSM Module
5. Arduino UNO

The description of each of these units and their interfacing with Arduino Uno as presented below.

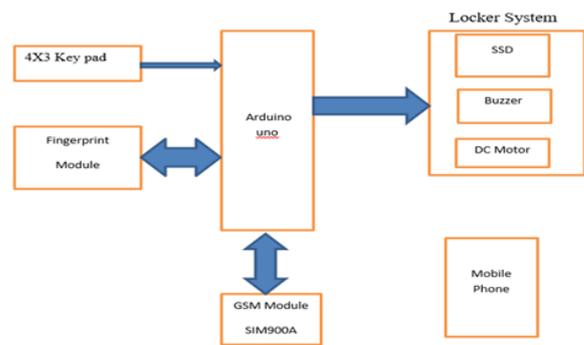


Figure 1. Block diagram of Advanced Alert Home locker security system.

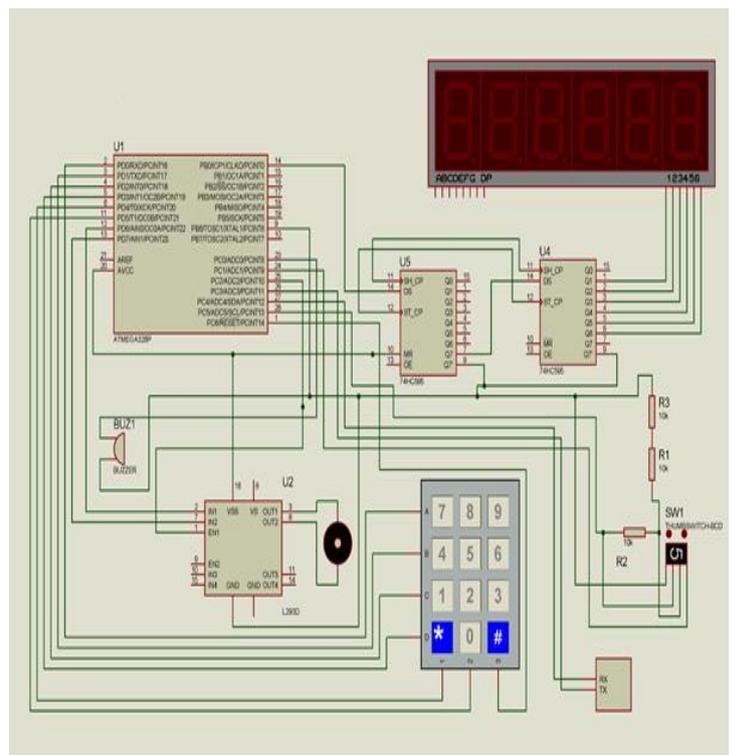


Figure 2. Schematic diagram of Advanced Alert Home locker security system with Fingerprint and Soft password with Arduino Uno

3.1 Fingerprint Scanner - TTL (GT-511C3)

The module itself does all of the heavy lifting behind reading and identifying the fingerprints with an on-board optical sensor and 32-bit CPU. All need to do is send it simple commands. To get started, just register each fingerprint that we want to store by sending the corresponding command and pressing the finger against the reader three times. The fingerprint scanner can store different fingerprints in database and we

can even be downloaded from the unit and distributed to other modules. The module can also store up to 200 different fingerprints. The module is small and easy to mount using two mounting tabs on the side of the sensor. The on-board JST-SH connector has four signals: Vcc, GND, Tx, Rx. A compatible JST-SH pigtail can be found in the related items below. Figure-3 shows the GT-511C3 Fingerprint scanner [14] used in the present work as biometric authentication device.



Figure 3. Fingerprint scanner(GT-511C3)

3.2 Driver Unit of H-Bridge and Motor

In the present work H-bridge as shown in figure 4(a) is used to drive the motor with sufficient current and it has four switching elements at the "corners" of the H and the motor forms the cross bar. The current flows and the motor begins to turn in a "positive" direction if current flows the other direction through the motor and the motor turns in the opposite direction.. The Driver Unit and Motor with Electromechanical arrangement as presented in Figure 4(b)

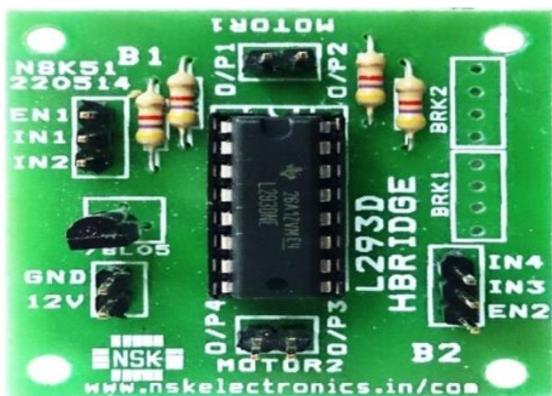


Figure 4 (a). Motor driver circuit of H-bridge

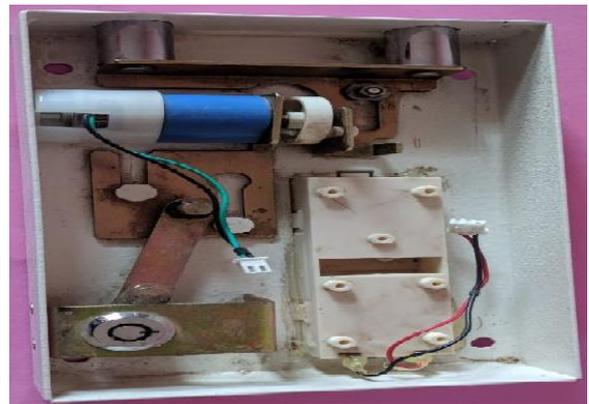


Figure 4 (b). Electro mechanical Motor arrangement

3.3 Key pad and Seven Segment Display

In present work 4x4-matrix keypad is used and it provides a useful human interface component with Arduino UNO to enter the password and has convenient adhesive backing provides a simple way to mount the keypad in a variety of applications. And SIX digit multiplexed seven segment is used as display unit with 74LC for displaying messages. of password, OPEN and CLOSE and also changing the password provision as interfaced with Arduino UNO as shown in figure 5.



Figure 5. Multiplexed Seven segment display and 4x4 Key pad.

3.4 GSM modem – sim900

The Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world[14]. In the present work the GSM module which is shown in figure-6 is the kernel part to realize wireless data transmission. Wireless communication module SIM900 based on standard of GSM produced by SIMCOM company is used in the developed application. To send the alert messages by implementing its commands in the software program.

The module is a Triband GSM/GPRS solution in a compact plug in module featuring an industry-standard interface [6].



Figure 6. GSM SIM900 Circuit

3.5 Arduino UNO

Arduino is an open-source platform and consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board which is shown in figure-7. The board having the following features.

Features

- Operating Voltage: 5V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by boot loader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz .

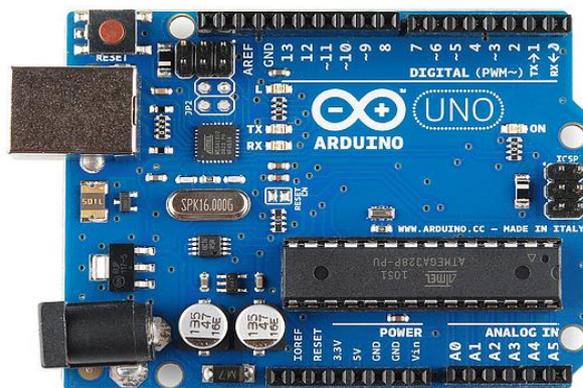


Figure 7. Arduino UNO board

4. Algorithm and Flow chart for Advanced Alert Home Locker Safety Security System as presented below.
 1. Initialise Fingerprint and GSM Module
 2. To keep finger on the fingerprint module
 3. Check and compare the present fingerprint read with already stored fingerprint of the authenticate user. If not matched, then initiate the GSM module to send alert message to the user and make the i/o line high to the buzzer and sent the message of that somebody trying to open the locker system.
 4. If matched, then enter the password to open the locker normally.
 5. Check and compare the present password with entered key and already stored authenticate password used by the user.
 6. If not matched, then initiate the GSM module to send alert message to the user and make the i/o line high to the buzzer and sent the message "somebody trying to open the locker system and try once again with authenticate password".
 7. If matched, then make the I/O line high through driver unit connected motor rotates in clockwise direction to open the door of the locker system for taking the user belongings which required from the locker.
 8. After completion of the work then close the door and enter the same password which makes

the I/o line connected to the motor rotates in anticlockwise to close the door.

- The same steps from 1 to 8 if the user want to operate the Home locker system. The figure 8 shows the algorithm for operation of home security systems.

The process of GSM based Advanced alert Home locker safety security system is presented figure 8.

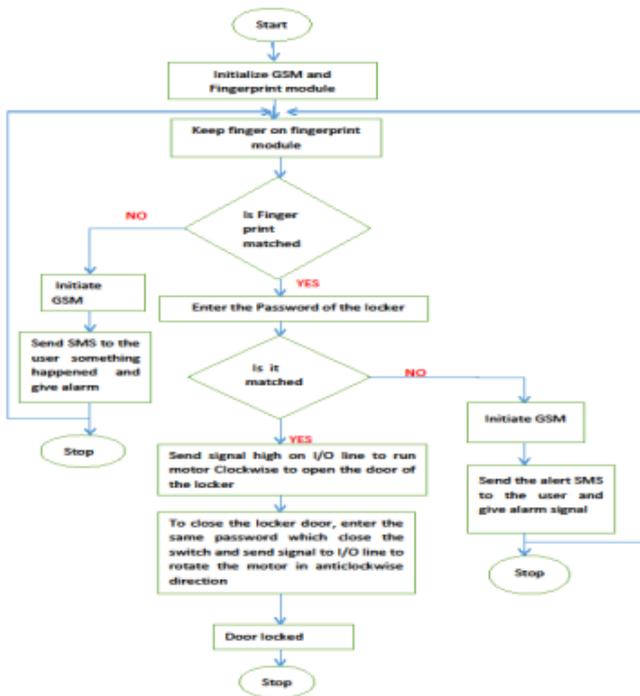


Figure 8. Flow chart for Fingerprint and Soft password based Home Locker Security System using GSM Modem

5. Result and Discussion

The proposed Home locker safety security system has been successfully developed and implemented in our laboratory as shown in figure 9.

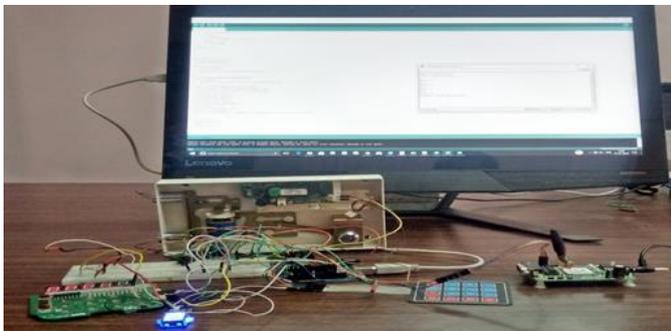


Figure 9. The complete System of GSM based Advanced Alert Home Locker Safety Security System using Adriano Uno

The working procedure of the system is mainly consists of FOUR steps. Step one is IDLE state. Step two is OPEN state, step three is CLOSE state and step 4 is CONFLICT state.

IDLE state: Generally this mode is an ideal mode which appears when system is powered ON and it initialize the all the peripherals attached to the system like finger print module, seven segments display module and GSM module which is shown in the figure 10.

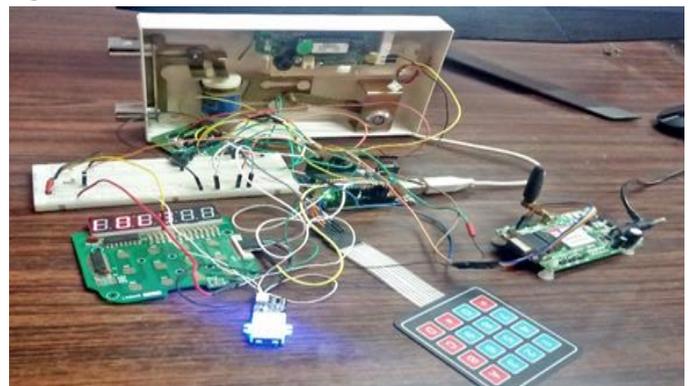


Figure 10. Idle mode of the home security system

OPEN State: If the system is in open mode, the following tasks were need to fulfil, Viz. first, person fingerprint needs to match, after fingerprint match successfully it sends the SMS (“Your are Finger matched”) through GSM modem to the authentication person’s mobile number. In second step alpha numerical password needs to match, if it matches successfully once again the system will send the SMS (“Password Match Successfully) to the authentication person. If both the steps are successfully completed the system open the door lock connected to the DC motor and display the “OPEN” message on seven segment display which is shown in figure-11 as well send the message (“DOOR is OPEN”) through the SMS.

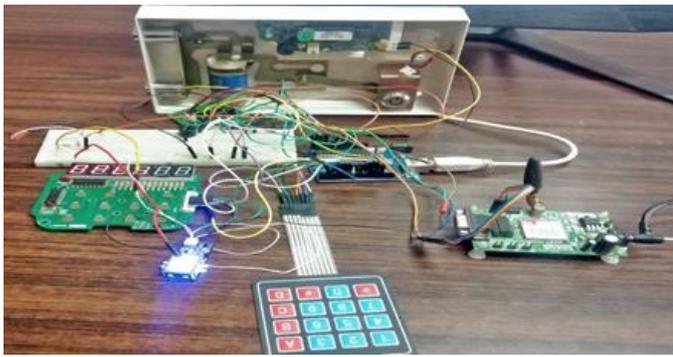


Figure 11. Open state of the Home security system

CLOSE state: In closing state the authentication person need to once again enter the alpha numeric password. If it successfully matches the door will have closed and the “CLOSE” message displays on seven segment display which is shown in figure 12 as well as the message (“DOOR is closed”) send to the authentication person through the SMS. After this state the system will come to IDLE state.

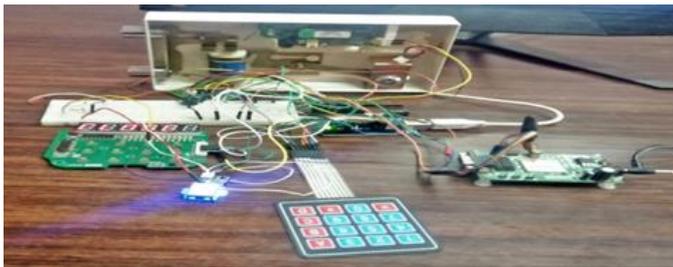


Figure 12. Close state of the Home security system

CONFLICT State: If, either OPEN state or CLOSED state is something went to wrong like mismatch of fingerprint or password the system will enter into conflict state and it display “ERR” message on seven segment display and same information send to the authentication person through the SMS. Is shown in figure 13

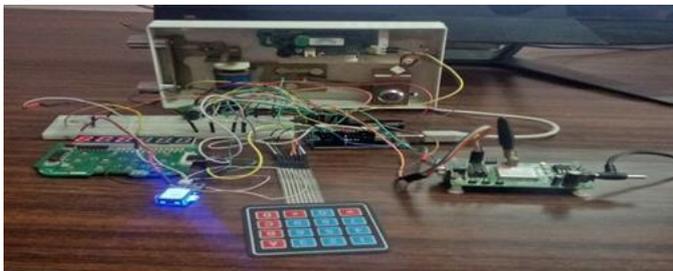


Figure 13. ERROR state of the Home security system

IV. CONCLUSION

The developed system is tested and implemented in our laboratory using FINGERPRINT, SOFT PASSWORD and GSM as an Advance Alert Home Locker safety and Security system. And we found the systems working is satisfactory. The systems having advanced features like portable and low cost and standalone system. The future work of this paper is planned to a develop in addition with another important Bio-metric parameter of Iris scanner for visual identification of the person, vibrating and also with fire sensor for better security. And also we need to add Internet of Things feature to this system.

V. REFERENCES

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