

Advance Digital Locker System Using Raspberry Pi

Mr. Akshay Adivarekar¹, Mr. Vishal Patil², Mr. Tejas Patel³, Mr. Akshay Patere⁴,

Mr.G.S.Kulkarni⁵

^{1,2,3,4,5}Department of Electronics and Telecommunication Engineering, Finolex Academy of Management and Technology, Ratnagiri

Abstract – Nowadays security is one of the important factor of our day to day life. The people use different kind of lockers to store their valuable things. To provide security for any locker is difficult task. Even though the locker is digital but it may be easily access by unauthorized person. In many industries, in banking system and in jewelry shops there may are so many valuable things like some important papers, some customer information and jewelry etc. The aim of this project is to design and implement affordable, flexible locker system using Raspberry pi with Telegram messenger. The system is designed to detect unauthorized activity and the image of unauthorized person is captured by camera and sends to Telegram. The system having 3 stages in which first stage is simple password based stage which is known to only authorize person. Second stage is based upon the OTP (One Time Password) which is send by the raspberry pi to the Telegram messenger of the authorized person and third stage is based upon the biometric of the authentic user. The use of those three stages makes the system more secured and avoid unauthorized access of unauthorized person.

Key Words: OTP, Telegram, Biometric, Raspberry Pi,

1. Introduction

The word security indicates protection of our life and assets. The safety of the valuable things of people is also the important thing in today's world. Hence, mainly focusing on bank locker security or personal important document security is very important to avoid the further problems in monitored area. One can use the mechanical lockers but that kind of locker can be easily break by the robbers. That's why it is required to develop the system which cannot be easily breakable. So, many authors' present different kinds of digital locker system, automatic password-based locker system, software-based locker system etc. which have been widely used in banks, houses, offices etc.

To avoid the unauthorized access may locker uses the Biometric authentication, Password based protection, Mechanical System. Nowadays, many Digital Locker security systems used modern technology like face recognition systems, face detection systems, wireless sensors, PIR sensors, RFID techniques, smart cameras etc. and because of those techniques the people can ensure the safety of their valuable things. Hence, people need not to be worry about the locker security though they are away from the location of locker. In this project we have made a locker system which is having some security stages and which fulfill the requirement of the security. Important thing is to provide higher security.

2. Literature review

Mohammad Amanullah proposed a Microcontroller Based Reprogrammable Digital Door Lock Security System. This system is composed of the microcontroller based by using matrix keypad & GSM/CDMA network. The microcontroller based digital door lock security system is an access control system that allows only authorized persons to access restricted area. The password is stored in PROM so that it can change any time. In this system matrix keypad is used .When anyone enter the password in the keypad, microcontroller verify this password. If this password is correct the motor will rotate and the door will be open. But if someone enter wrong password a red signal will be ON which means that the entered password is wrong.GSM/CDMA module can be used to operate the device, when anyone make a call from his mobile to the receiving device which is set in main circuitry will receive the call and if the call is from desired number then rotate the motor and the door will be open. The IPS circuit is used for giving backup in case of emergency when there is a power failure. [1]

This paper proposes the system which telephone controlled and password based door lock system. The most objective of this technique is to unlock a door by a mobile employing a unique code entered through the keypad of the

phone. Opening and shutting of doors involves human to be physically involved in to the task. During this telephone controlled, password protected door locking system, the opening and shutting of a door is achieved by employing a mobile. The owner can call to a mobile stacked to the system which successively is connected to the door motor which will open/close the door by entering the password. The telephone within the system is kept in auto answer mode. So, after a hoop the telephone accepts the decision and starts voice transmission. Now for the button pressed, the DTMF tones are fed to the circuit and therefore the corresponding actions are performed. [2]

The purpose of this technique is to make a micro-controller based Digital Code Lock that serves the aim of security. The microcontroller based Digital Code Lock is a system that access only authorized persons to a restricted area. An access control for doors forms an important link during a security chain. The system comprises of a push keypad connected to the 8 bit microcontroller ATmega328P. The system will allow presetting a password. The lock will open if and as long as they entered password matches the preset one. If the entered password is wrong a buzzer are going to be activated. [3]

The goal of this system is to develop a singular system through mobile technology which may control various units of the homes, industries, and also provides a security system. The varied appliances are often utilized by operating them remotely by using GSM technology, which enables the user to remotely control the operations of the appliances. Just by pressing button the user can perform ON/OFF operations on the appliances. This technique is meant to stop the opening of the door by unauthorized persons. The home security system consists of keypad and a GSM modem for the safety dial up interfaced to the microcontroller. The keypad interfaced to the controller is employed because the password entry system to open/close the door. As soon because the user enters the right password, the door lock opens. If the password entered is wrong, then a security alarm is rung and at the same time it enables the safety dial-up through the GSM modem interfaced to the microcontroller. When the unauthorized person gives an invalid password then the controller uses the modem to tell the owner. [4]

Ilkyu Ha proposed IoT based Digital Door Lock System. A digital door lock system which will work with the IoT environment is proposed. The system provides strengthened security functions which will transfer captured images to an authorized person's mobile device when an invalid user attempts an illegal operation. Also the system delivers alarm information to the authorized person's mobile device when the door lock is physically damaged. This system enables a user to see the access information and remotely operate the door lock to reinforce convenience. [5]

3. PROPOSED SYSTEM

3.1 Details of Hardware and Software

3.1.1 Raspberry Pi-3B plus model



Fig 1: Raspberry Pi-3B plus model

Raspberry pi board plays most important role in the circuit, It takes all the data from sensor output, process it and sends it to the user with the help on Wi-Fi model which is included in raspberry board itself. Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC) which includes a 700MHz ARM1176JZF-S processor, Video core IV GPU and RAM. The raspberry pi acts as main controller in this project.

3.1.2 Camera Module



Fig 2: Camera Module

Camera module is comes with the raspberry pi. It is used to capture the images when a person tries to access the confidential room. The system will send captured image to Telegram account of authorized person.

3.1.3 Fingerprint Scanner



Fig 3: Fingerprint Scanner

The fingerprint module is use for the biometric authentication. The fingerprint scanner is connected to the raspberry pi which checks the fingerprint of the user and unlocks the locker.

3.1.4 Keypad



Fig 4: Keypad

A 4*3 matrix keypad is used to enter the password. It consists of 12 keys (S0-S11) arranged in the form of a square matrix of four rows and three columns. Each key in the matrix is labeled according to the operation assigned to it. The password enter by the user is checks by the raspberry pi.

3.1.5 I2C LCD 20*4 Display

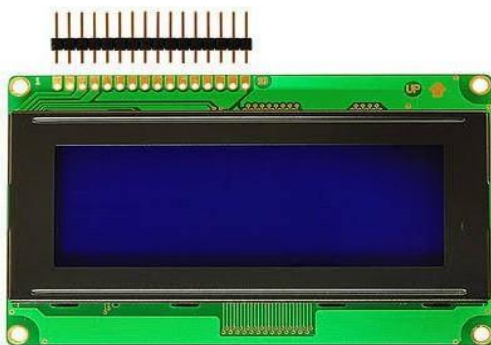


Fig 5: I2C LCD 20*4 Display

The LCD 20x4 display is use to display information for user and give user an interface to input entry password, enter the OTP and place the finger. The display come with an I2C LCD controller it make the connection simpler because it require lesser raspberry pi GPIO pins for it to work. It is having total have 4 input pins which is VCC, GND, SDA, and SCL. The data for display only used 2 pins and it will be connected to raspberry pi GPIO pins and another pin VCC will connect to 5V power source, GND will connect to ground pin. The display helps to make the system user-friendly.

3.1.6 DC Motor



Fig 6: DC Motor

The motor is used to unlock and lock the doors of the locker. By applying appropriate polarity one can easily adjust the direction of rotation of the motor.

3.1.7 Raspbian OS

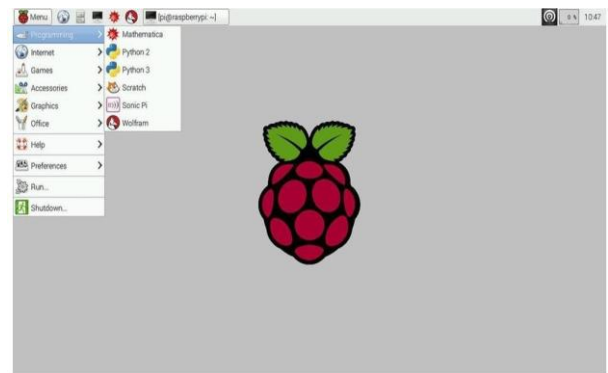


Fig 7: Raspbian OS

Raspbian is the free and foundation's official supported operating system based on Debian optimized for the raspberry pi hardware. Raspbian provide more than pure OS if compare to the other operating system. It comes with over 35000 packages, precompiled software bundled in a nice format for easy installation on raspberry pi. Software like python IDE, Scratch and more are included in this OS.

3.1.8 Python



Fig 8: Python

Python is a free and open source programming software and also is an IDE stand for integrated development environment for Python. In Raspbian OS, python IDE is a built in software and installed with python2 and pyhton3. In this project python IDE will be used write the code and test it.

3.1.9 VNC Viewer

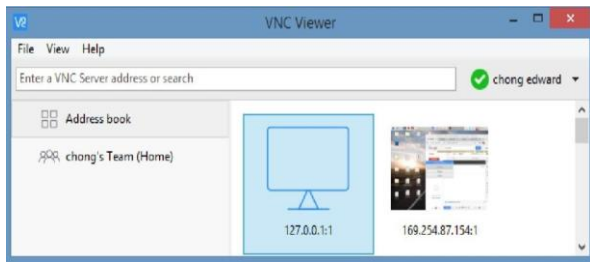


Fig 9: VNC Viewer

VNC Viewer is used to access the raspberry pi. It provides the GUI interface of the raspberry pi. It is very helpful and user-friendly software.

3.1.10 Telegram



Fig 10: Telegram

Telegram is an online instant messaging application which can use at computer and mobile phone. In this project we have used the telegram to get the message and images of unauthentic person from the raspberry pi.

3.2 System Working

3.2.1 Algorithm

Flow of working of the system and flow of the program are shown in these following steps:

Steps Included:

1. Initialize the Raspberry pi, Camera and other sensors.
2. Enter the password using Keypad.
3. If Password is wrong then send the message to the Telegram bot that Wrong password for first stage and send the photo of the person using the locker.
4. If the attempts of entering the password is exceeds then sleep the whole system.
5. If password is correct then enter the OTP using keypad which will be send to the Telegram bot after unlocking the first stage.
6. If OTP is wrong then send the message to the Telegram bot that Wrong password for second

- stage and send the photo of the person using the locker.
7. If the attempts of entering the OTP is exceeds then sleep the whole system.
8. If OTP is correct then place the finger on the finger print scanner.
9. If finger print does not match then send the message to the Telegram bot that fingerprint does not match for third stage and send the photo of the person using the locker.
10. If the attempts of fingerprint authentication is exceeds then sleep the whole system.
11. If fingerprint matches then unlock the locker.
12. To lock the locker press the lock button present inside the locker. After pressing the button the door of locker will be closed.
13. When the user press lock button then locker door will be close and user required to repeat the whole process to unlock the locker.

3.2.2 Block Diagram

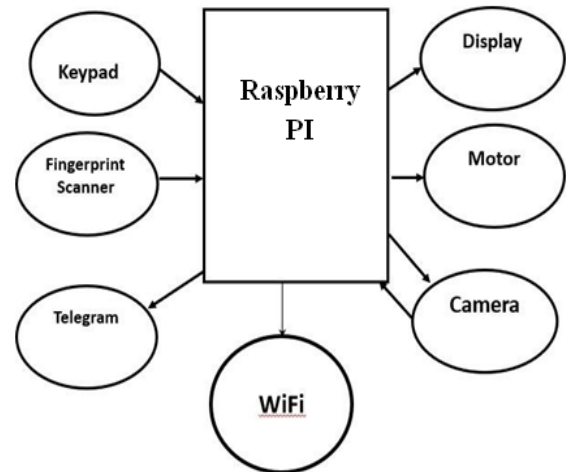


Fig 11: Block Diagram

For the complete system we are using Raspberry pi 3B+ model is for main control unit and all the components are interface with this module. 20*4 LCD Display is used along with I2C convertor. To get the correct password input from the person here matrix keypad is interface with raspberry pi module. For fingerprint authentication we have to use fingerprint sensor module. Pi camera module is used to take the photo of unauthenticated person along with date and time. Telegram messenger is connected with raspberry pi module for communication between authenticated person and locker system. And it will send correct OTP

for authenticated person to open the locker. After three step authentication of person the stepper motor is used to open the door of the locker system.

3.2.3 Flowchart

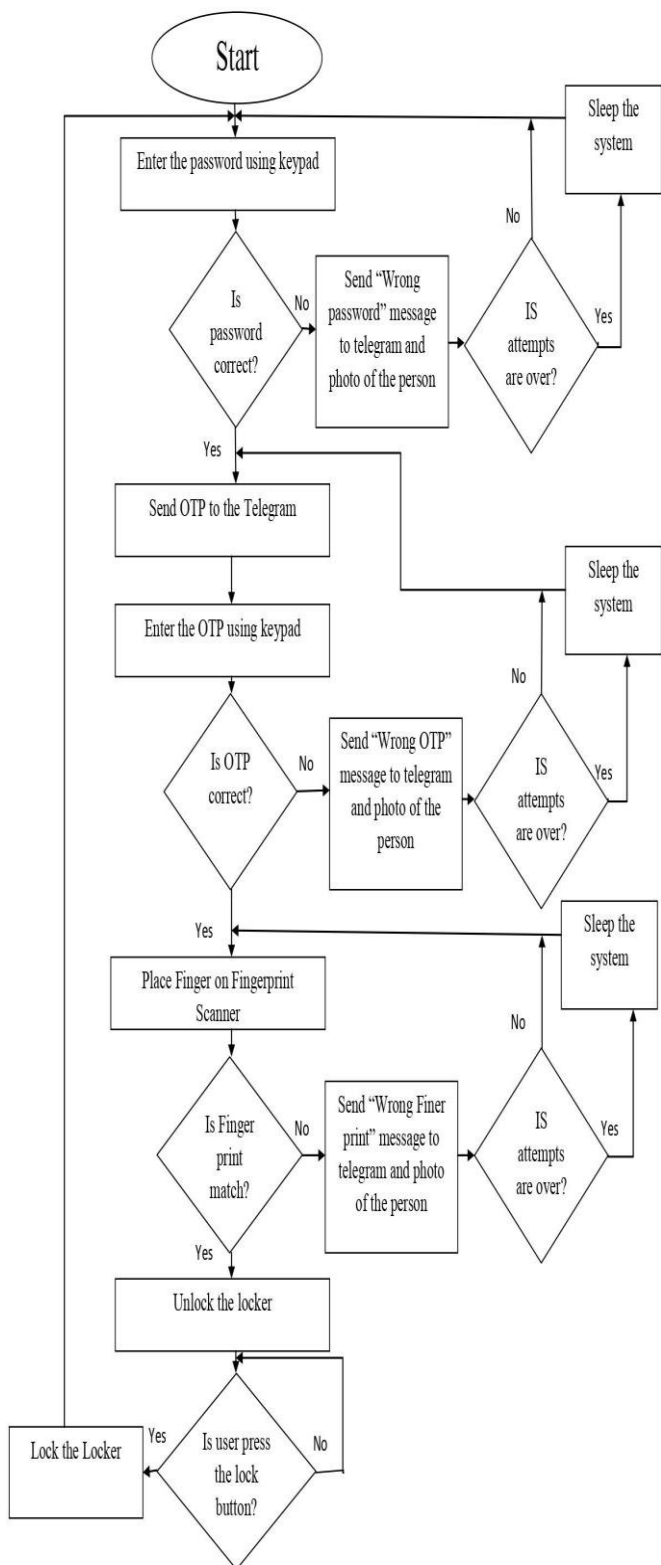


Fig 12: Flow chart

4. Results



Fig 13: Final Implementation of locker

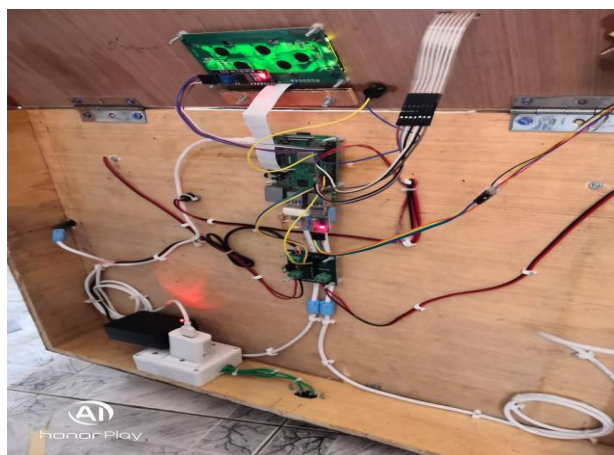


Fig 14: Internal Circuitry of Locker System

5. Conclusion

Nowadays there are so many locker system available in market. Some are password based, some are fingerprint based and some are based on the face reorganization. By considering these all situations we developed a digital locker which provides the more security than available lockers.

When the unauthorized person try to unlock the locker, the locker will capture the image of the user and send to the authorized user telegram application. If the person the whole system will get down and no one can open the lock. In the next stage OTP will be send to the authorized user Telegram and in third stage authorized user need to scan his biometric to open the locker. By integrating all these three stages makes the system more secured and capable enough to maintain the security.

The system proposed here will definitely useful in industries sector, in jewelry shop, in bank locker and it also useful in personal use.

6. Future Scope

In this project we consider only the password based authentication, OTP based authentication and Fingerprint based authentication. The security level can be further increase by using the face reorganization.

We have used only four digit password. The six digit password can also make the system more secure.

We have used Telegram to send the message to the authenticated person instead of that we can use the GSM module which will send the Text message to the user without any requirement of internet.

References

1. Mohammad Amanullah "Microcontroller Based Reprogrammable Digital Door Lock Security System By Using Keypad & Gsm/Cdma Technology", IOSR Journal of Electrical and Electronics Engineering (IOSR - JEEE), Volume 4, Issue 6 (Mar. - Apr. 2013).
2. Ashish Jadhav, Mahesh Kumbhar, Mahesh Walunjkar, "Feasibility Study Of Implementation Of Cell Phone Controlled, Password Protected Door Locking System", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 1, Issue 6, August 2013.
3. Rahul A P, Pranav V, Ponni S, Renjith Nadeshan, "Design And Implementation Of A Digital Code Lock", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 2, February 2014.
4. Arpita Mishra, Siddharth Sharma, Sachin Dubey, S.K.Dubey, "Password Based Security Lock System", International Journal of Advanced Technology in Engineering and Science, Volume No.02, Issue No. 05, May 2014.
5. Ilkyu Ha, "Security And Usability Improvement On A Digital Door Lock System Based On Internet Of Things" International Journal of Security and Its Applications, Vol.9, No.8 (2015).
6. E.Supraja, K.V.Goutham, N.Subramanyam, A.Dasthagiraiah, Dr.H.K.P.Prasad, "Enhanced Wireless Security System With Digital Code Lock Using Rf &Gsm Technology", International Journal of Computational Engineering Research, Vol 04, Issue 7, July – 2014.
7. Kawser Wazed Nafi, Tonny Shekha Kar, Sayed Anisul Hoque, "An Advanced Door Lock Security System Using Palmtop Recognition System", International Journal of Computer Applications (0975 – 8887), Volume 56– No.17, October 2012.
8. S.Ramesh, Soundarya Hariharan and Shruti Arora "Monitoring And Controlling Of Bank Security System", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 10, October 2012.
9. Shraddha Pramod Nikumbh, Vijay D. Chaudhari, Dr. K. P. Rane, "Fingerprint Recognition With Monitoring On Remote Whats App", International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 4 Issue: 5, May 2016.
10. M. R. Navya* and Prakash Ramachandran "Development Of Secured Home Automation Using Social Networking Sites", Indian Journal of Science and Technology Vol 8(20), IPL0116, August 2015.
11. S. Nazeem Basha, Dr. S.A.K. Jilani, Mr.S. Arun, "An Intelligent Door System Using Raspberry Pi And Amazon Web Services Iot", International Journal of Engineering Trends and Technology (IJETT), Volume 33 Number 2- March 2016.
12. Seung-Soo Shin, Kun-Hee Han, Kwang-Yoon Jin, "Digital Door Lock On The Access Control System Using Otp-Based User Authentication", International Journal of Digital Content Technology and its Applications (JDCTA), Volume 7, Number 11, July 2013.
13. Miss. Pradnya R. Nehete, Kantilal P. Rane "A Paper On Otp Based Door Lock Security System", International Journal For Emerging Trends in Engineering and Management Research (IJETEMR), Volume II, Issue II -21st June 2016 (ISSN NO: 2455-7773).