Security Locking System Using Internet of Things (IOT)

Sk.Shaheena Kowsar[1], Sk.Asiya[2], SSL Prasanna[3], P.Sruthi Bhavani[4]

Department Of ECE, Vasireddy Venkatadri Institute Of Technology, Guntur.

Abstract

This paper presents the development and implementation of a Biometric Based Security Locking System that will automatically unlock a locker when a registered fingerprint is sensed. The method employed in accomplishing this involves the use of a fingerprint scannerDY50 interfaced with Raspberry Pi-B3 microcontroller to actuate the locking and unlocking process of a locker. Once a registered finger print is placed on the sensor, access is granted to the user, the locker slides open and it closes after five seconds. During this process, an alert mail regarding the locker is sent to the owner. If an unregistered fingerprint is sensed, access is denied. The developed Biometric Based Security Locking System was tested and it functioned in line with the desired objectives.

Keywords: Raspberry-Pi, IoT, Fingerprint Sensor, USB to Serial converter, Servo motor

INTRODUCTION

The Internet of Things (IoT), is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Biometric is the technical term for body measurements and calculations. Biometric identifiers are the distinctive, measurable characteristics which are used to describe an individual. Today security and safety is becoming more and more popular day by day and it is getting improved and used for the ease in our life. Now a day, technology has become an integrated part of people's lives therefore the security of one's home-locker must also not be left behind. The purpose of this project is to design a system which will control by using fingerprint sensor. This system mainly consists fingerprint sensor module to detect individual, Raspberry Pi Model B3 which have inbuilt Wi-Fi module, a PC as a displaying unit. Whenever an individual's fingerprint gets sensed, if it matches with the enrolled one, he/she gets the access and the locker open otherwise the access is denied. This proposed work is to send an alert mail to the owner. This project requires two Internet connections one at Raspberry pi end and other at user end.

LITERATURE SURVEY

Hasan, et al [1], designed a microcontroller based home security system with GSM technology. A mobile phone is interfaced with the microcontroller through a Bluetooth device in order to control the system. A manual keypad is another way to lock or unlock the system. It is a reliable security system because its bi-modal (parallel) nature, but the system lacks code registration mechanism and the microcontroller program lacks auto generated code routine. Modifications can be made in the design by adding auto-generated code device and making the

security features work serially, thus making it multiprotocol device.

Alagu et al., [2], designed GSM based authorized access with separate user password door lock/unlock control system. SMS application sends data through GSM Modem. Another GSM device connected at the receiving end which is fed to the microcontroller. The microcontroller initiates a mechanism to open the door through a motor driver interface, if the sent data (password entered by the user) matches with the password stored in the microcontroller. This is simple and will give a good value for investment but the program in the microcontroller lacks auto-generated code routine. Improvement can be made by programming the microcontroller to generate codes.

Ushie et al., [3], designed and constructed a prototype security door that can be remotely controlled. A GSM phone set acting as the transmitter and another GSM phone set with dual tone multi-frequency (DTMF) connected to the door motor through a DTMF decoder interfaced with microcontroller unit and a stepper motor. It provides an easy way of controlling a lock without physical contact, but the system lack true user identification system such as biometric and face detection facility. It also lacks notification and alarming system. An improvement can be made by adding another security feature to increase the security reliability.

Crystalynne et al., [4], developed a microcontroller-based biometric locker system with short message service (SMS). The system scans fingerprint, match it with the saved pattern and unlock the locker. The global system for mobile (GSM) module was able to send text message containing the auto-generated pass code of the locker when an unrecognized fingerprint was encountered. It is a simple and reliable way of safeguarding a lock system, but the system has no registration mode mechanism to

register finger pattern of new user. An improvement can be made by incorporating registration mode and adding another security features to increase the security reliability.

Nwankwo et al., [5], designed security door that opened by pressing the keys of the assigned codes on the mobile phone, or by entering the corresponding code in a computer set interfaced with the system. The door opens automatically when the right code is entered and remains open for 10 seconds before closing back. The security system is affordable but lack auto-generation code and registration mode mechanism. An improvement can be made by adding biometric, auto-generation and registration mode mechanism.

METHODOLOGY

In order to implement the smart door model we need a list of materials which is briefly mentioned below:

Raspberry Pi: Fig.1 shows Raspberry Pi (RP) which is an ARM-based single board computer. The Raspberry Pi 3 Model B is the third generation Raspberry Pi [3].It has Broadcom BCM2837 64bit ARM Cortex-A53 Quad Core Processor SoC running at 1.2GHz and 1GB RAM. The operating system used for Raspberry Pi is Raspbian as it is open source anyone can use. Raspbian is a Linux-based computer operating system. It has 40 pins in which 24 are GPIO pins these pins are used for general purpose, 8 ground pins, two of each 5V and 3V power pin. It has four USB-2 ports and a Micro USB power source. It runs on the 5V power supply. Additionally it adds wireless LAN.

Fig.1 Raspberry pi model B3

Servo Motor: The Fig.2 shows the servo motor which is attached to a GPIO (PIN 17) of the Raspberry pi model A and control its rotation utilizing pulse-width modulation. The Fig.3 shows the Servo motor circuitry. The servo is powered by a 6V-battery pack.
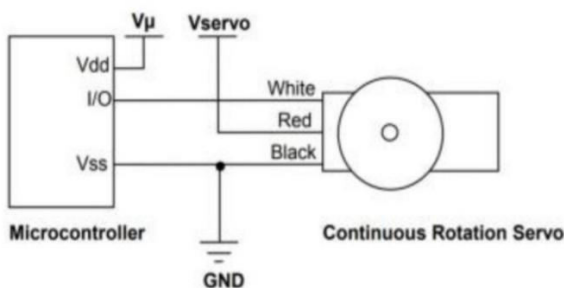

Fig.2 Servo Motor

Fig.3 Servo Motor Circuitry

Fingerprint Sensor: The sensing unit consists of a fingerprint scannerDY05. The Fingerprint sensor processes fingerprint in two parts; *fingerprint enrollment* and *fingerprint matching*. When enrolling, the user needs to place the same finger twice on the scanner. The system will then process

the two fingerprint images, generate a template of the finger based on processing results and store the template. When matching, the fingerprint scanner scans the user's finger capturing the fingerprint and then compares it with templates of the fingerprint library in the microcontroller. Then the system will return the matching result as either success or failure. The Fig.4 shows the Fingerprint sensor.

Fig.4 Fingerprint sensor

USB to Serial adapter: The Fig.5 shows a USB to serial adapter, which is also referred to as a USB serial convertor or RS232 adapter is a small electronic device which can convert a USB signal to serial RS232 to data signals. RS232 is the type of signal which is in many older PCs and is referred to as a serial COM port.
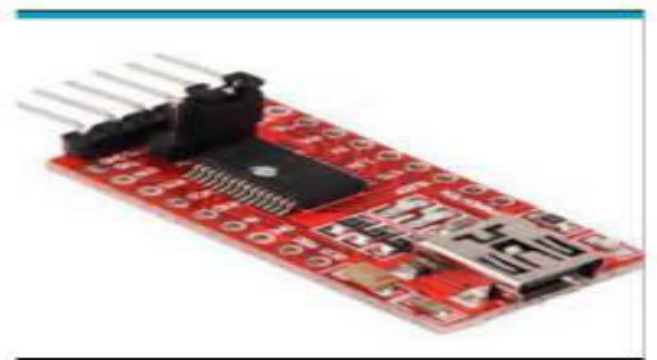

Fig.5 USB to serial converter

MODE OF OPERATION

The Fig.6 is a flow chart which shows the mode of operation of Security Locking System using IoT.
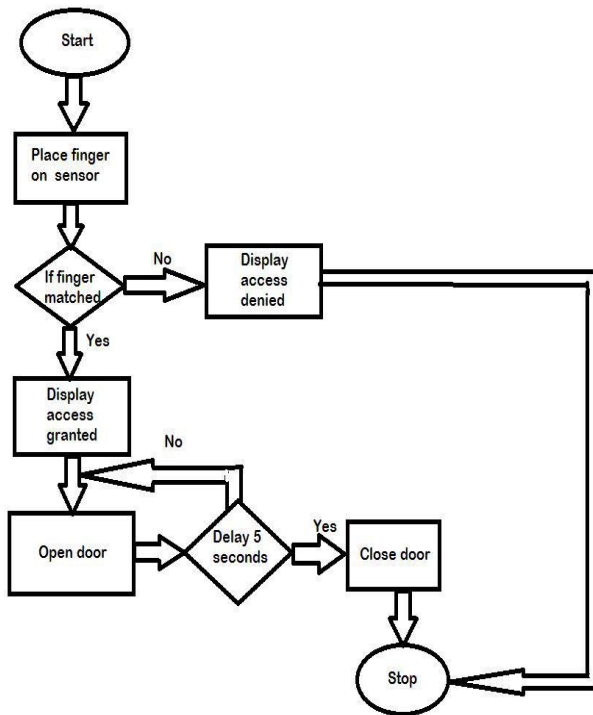

Fig.6 Flowchart of security locking system

Step 1: Initially all the fingerprints of the respective people are collected and stored in the database.

Step2: Whenever a person wants to have his/her access, then he/she has to scan his/her fingerprint again.

Step3: This fingerprint is compared with the original fingerprint which was already stored in the database.

Step4: If both the fingerprints matches, then the PC will display the message "Finger print matched".

Step5: If both the fingerprints are not matched, then the PC will display the message "no valid fingerprint".

Step6: Then the inbuilt Wi-Fi Module will be activated and will send a message to the original user.

Step7: And the servo motor connected will open the locker, Otherwise access is denied.

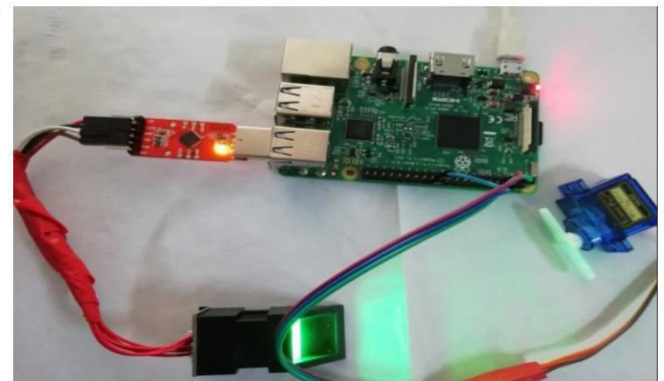The following Fig.7 shows the hardware connections of Security Locking System using IoT

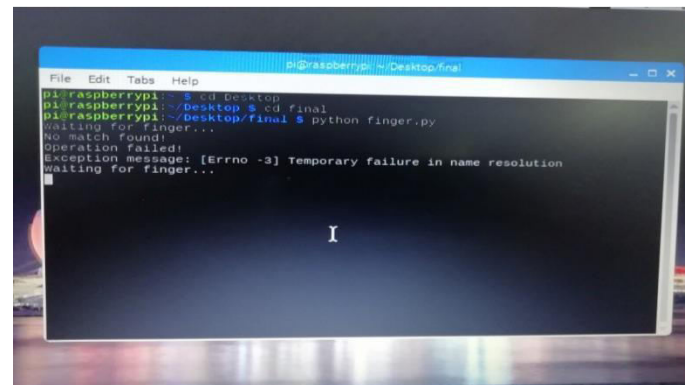Fig.7 Security Locking System Circuitry

RESULTS

Fig.8 Fingerprint checking

The Fig.8 shows the way of checking whether the fingerprint is enrolled in the database or not
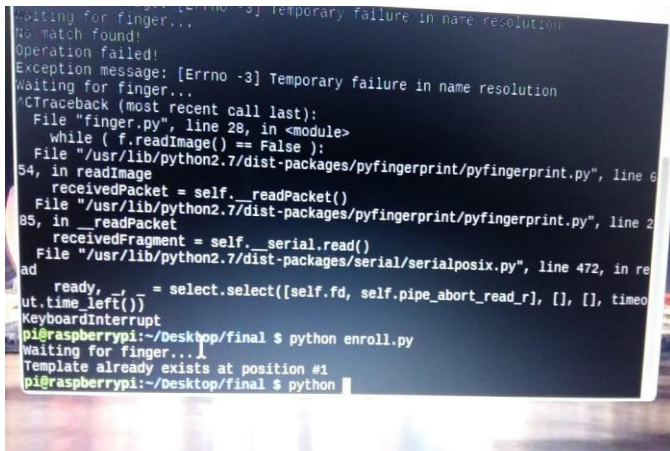
Fig.9 Enrolling fingerprint

The Fig .9 shows the process of enrolling a new fingerprint into the database.
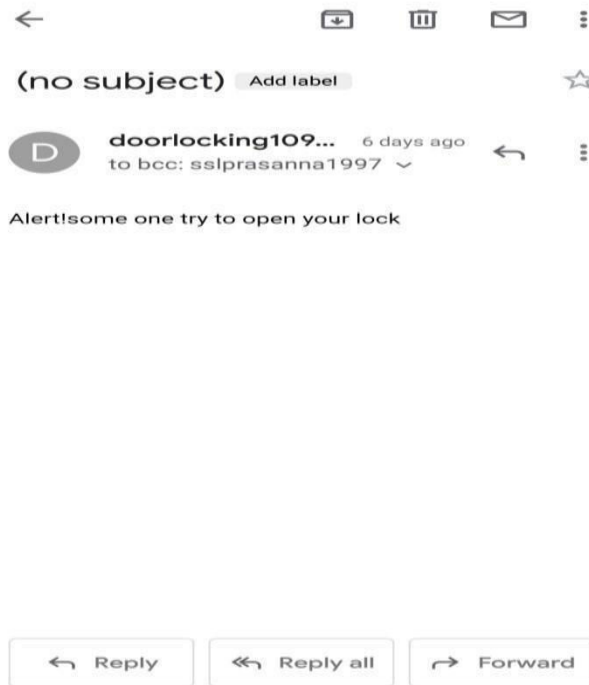

Fig.10 Alert message

The Fig.10 shows the mail received by the owner when someone tries to open the lock. We designed the System which reduces humanefforts and provide security. Proposed system is cheap, reliable and components are easily available.It is also portable and easily upgradable. System provides Security locks for door, comfort, connivance, security and energy efficiency for user. Raspberry Pi-3 Model B operates and controls motion detector and cameras for capturing the image of the guest. The security level is increased

due to the usage of Raspberry Pi-3 Model B which sends the images to the user.

ADVANTAGES

1. Fingerprint based security system is most secured system as compared to other systems. Because that RFID card or Keys of lock can be stolen, password may be leaked. However thumbnail of every human being is unique, so lock will not open unless the same person is present to give the impression of fingerprint.
2. No need to carry the keys to open the lock. Or even there is no need to remember the password or any Pin number.
3. One of the main advantages is that this system remembers the stored password even if the power supply is turned off.
4. Scientific research and studies have proved that **fingerprints do not change** as you grow up.
5. Using Fingerprint **saves time** to gain access as compared to other methods like RFID card, Password or Key.
6. It has in built capabilities of connecting to external devices. Raspberry pi proves to be smart economic and efficient platform for implementing the home security system and for automation.
7. The additional advantage is, Necessary action can be taken in short span of time.

APPLICATIONS

1. **Industrial application:** *"Fingerprint based security system"* project can be used by the employees, staff or workers in various industries like Automobile industries, manufacturing industries, Software development companies.
2. **Home or domestic application:** This project can be used to automate the door locking

process at our home, so the user need not to carry the door lock keys along with him, he can just use his/her finger to open the door.

3. **Bank Lockers or security safes:** Many of the banks use key based or password based locks for their lockers or safes. We can replace them with our security locking system

FUTURE SCOPE

Fingerprint based locks are revolutionary locking systems that open with just the touch of authorized user's finger; their increased use in various locking applications can actuate what would be known as 'keyless world'. In Future, Retina Scanner can be used instead of biometric.

REFERENCES

[1]. Hasan, R., Khan, M. M., Ashek, A. & Rumpa, I. J. (2015): Microcontroller Based Home Security System with GSM Technology, Open Journal of Safety Science and Technology, 5, pp 55-62.

[2]. Alagu L. R., Anandhajothi, A. & Selvakumari, P. (2015): GSM based authorized access with separate user password door lock and unlock control system, International Journal of Electrical And Electronics Engineers (IJEEE), Vol. 07 (01), pp 388-391.

[3]. Ushie, J. O., Donatus, E. B. O. & Akaiso, E. (2013): Design and Construction of Door Locking Security System Using GSM. International Journal of Engineering and Computer Science, Vol. 2 (7), pp 2235-2257.

[4]. Crystalynne, D. C., Jaswinder, S. B., Jocelyn, R. H., Ditche, J. C. A., Melvie, S. D. C. & Jaira, C. I. (2016): Development of Microcontroller-Based Biometric Locker System with Short Message Service" Lecture Notes on Software Engineering, Vol. 4 (2), pp 103-106.

[5]. Nwankwo, P. N., Nsionu, I. I. & Ezeilo, C. J. (2013): Design and Implementation of Microcontroller Based Security Door System (Using Mobile Phone & Computer Set), Journal of Automation and Control Engineering, Vol. 1 (1), pp 65-69.