

Biometric Security Locker for Shared access Using Raspberry PI

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Abstract—This project aims to an unlocking process that deals with the design approach of an IoT Real-Time door lock security system for shared access, based on Raspberry Pi 3 for intruder detection that reinforces biometric technology to provide essential security to our houses and associated control. The proposed system here uses a Raspberry Pi 3 for processing along with a fingerprint sensor for capturing templates and accessing of the door by the owner. A buzzer and a GSM are also used. Here, GSM is used to know the users or authorized persons, who entered into the area/occupancy by using the biometric sensor. The SMS with the person details will be sent to the remaining authorized persons through GSM module. If any unauthorized person is detected, the system alerts with the buzzer sound and an alert SMS is sent to the mobile phone of the owners using the Wi-Fi module of Raspberry Pi applying the IoT based software concept. Programming has been developed in Python environment for Raspberry Pi operation in the Raspbian OS.

Index Terms—IoT, Raspberry Pi 3, Fingerprint sensor, Buzzer, GSM, Raspbian OS

I. INTRODUCTION

In this modern world, crime has become ultra-modern too! Security concerns are increasing every day, in every field of living, be it vehicles, homes or the family members. Security and safety are becoming imperative day by day and getting superior to provide ease in our life. Nowadays, technology has become an integrated part of people's lives, therefore, the security of one's home must also not be left behind. For this concern various approaches are in place to address the problem. Most of the major door lock security systems have several loop holes which could be broken down to gain access to the desired place, and it creates a concern for a secure life style

and proper working environment. Additionally, terrorism and unauthorized access to places have become a major issue now-a-days, and there is a need for a secure system to prevent unauthorized access especially in shared access environment.

Doors serve as entrances to our homes, offices and many other kinds of enclosure; they may also provide access for strangers, criminals, and offenders. Doors are meant to be secured and to prevent intrusions from unwanted persons. Individuals and cooperate bodies are becoming more aware of the dangers associated with relying on keys and parameter fencing to provide security to exclusive areas of their apartments and organization because criminals and fraudsters can forge keys or make master keys that can be used to break into such rooms or offices. So, the security does matter in this daily life. Implementation of a reliable security system is essentially required to safeguard our assets and in the best and safest way possible. Traditional security systems require the user a key, a security password, an RFID card, or ID card to have access to the system. However, these security systems have deficiencies; for example, they can be forgotten or can be stolen by unauthorized people. As a result, there is a need to develop a home or door locking system that guarantees a higher security level. Fingerprint recognition is one of the most popular methods of biometric technology. When compared to other biometrics such as face, voice, and retinal scan, fingerprint recognition can be considered more natural. Focusing on home security, this paper proposes a system which provides a fingerprint-based smart door unlocking system. This system is based on the technology of Internet of Things (IoT), due to its wide use in the development of new systems with ease of implementation and low cost. The main focus

of this system is providing home security by giving access to only the owner of the home or to whom the authentication is provided by considering his fingerprint using a fingerprint module.

II. LITERATURE SURVEY

Security represents the protection of our life and assets. Ensuring the safety of peoples and their valuable things is very important for the prevention of illegal handling. Hence, mainly focusing on door lock security or gate security is very important to avoid further problems in the monitored area. Even with the use of mechanical locks, the crime, robberies happen due to the fact that such locks can be easily broken. So, there is a need to invent another kind of lock that cannot be easily broken. In the view of Nehete (2016), Door lock security systems are classified based on technology used as (i) Password based, (ii) Biometric based, (iii) GSM based, (iv) smart card based, (v) RFID based, (vi) Door phone based, (vii) Bluetooth based, (viii) Social networking sites based, (ix) OTP based, (x) Motion detector based, (xi) VB based, (xii) Combined system. Some of these are reviewed in this paper. All these have been widely used in houses and offices. This paper, therefore, tries to review the various recent works on the Automatic door lock system as presented in latest publications.

Several biometric technologies have been identified in security door systems (Jain, Flynn and Ross, 2007; PankantiPrebhakar and Jain, 2002). The fingerprint technology utilizes human fingerprint templates to recognize him through corresponding scanning device and this technology is not only employed in area of security, but also in forensic or crime investigations. The major limitations of fingerprint technology could be false acceptance or false rejection of individuals fingerprint due to aging and medical conditions of an individual which may hinder capturing by the fingerprint scanner. A fingerprint authentication system mainly comprises the (i) Sensor device for acquisition of biometric raw data (ii) Feature extraction for template creation (iii) Matcher to compare the actual biometric template with the stored reference templates and (iv) Reference archive for storing the biometric reference templates.

Hitachi (2004) worked on finger-vein-authentication as a method to ensure security to life and property. Two applications were demonstrated for door-access control. The techniques require users who want to access the door to have identity number. Finger-vein details are verified and authorization takes place. The system server tracks records of incoming and outgoing users. Convenience of use is a question for uneducated users.

Shoewu, Olaniyi and Lawson (2011) explore the concept of Biometric Fingerprint and Iris Recognition Technology for smart homes. Multi-biometrics system was employed to enforce reliability. User's fingerprints and iris data was captured and a processed generated template was stored in the database. During authentication, Fingerprint Recognition Technology (FRT) and Iris Recognition Technology (IRT) accept and compare the supplied biometric data with the database contents. Any mismatch in the data will leads to failed authorization. Despite the multiple security level, inability of users with disability remains it major drawback.

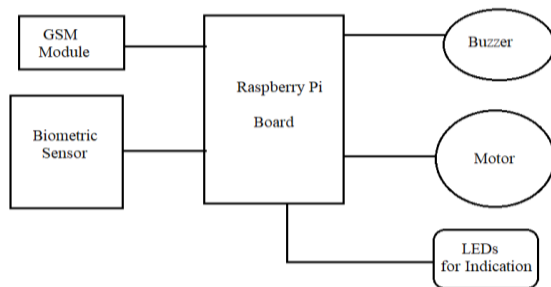
Burak, Tolga, and Huseyin (2015) present Real Time Smart Door System for Home Security. The system makes use of the development of video technology and Raspberry Pi as a security and safety tool in identifying and visualizing people who visit the home. The study uses two different technologies (Video and Smart Phone). The video was used to watch the front door in real time while the phone server as voice communication tool. The system presented in the study offers user several benefits which include having knowledge of visitors without accessing the door, streaming of activities behind the door and so on. Cost of real-life implementation remains the drawback of the system.

Though, some of the above papers reviewed are connected to this study in terms of biometric technology authentication and IoT but none of the works has combined the two technologies together. This work explored the two technologies an IoT enabled based door system for a reliable double-access authentication in home, banks, hotels and other establishments

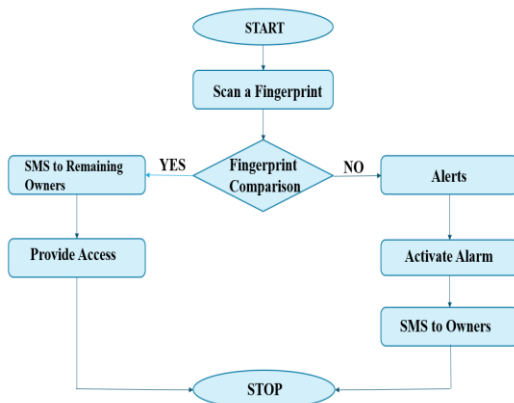
Some new digital locks take advantage of technologies like fingerprint scanning, iris scanning, retinal scanning, and voice print identification to

authenticate users. Door locking system provides advanced and fastest accessible security with ease of use for home doors and gates. Unauthorized access is ensured by setting a fingerprint by the User, if the fingerprint is matched, the door will be opened automatically otherwise a message showing unmatched fingerprint will be displayed on the monitor display and an SMS will be sent to the owner that the security was tried to be breached.

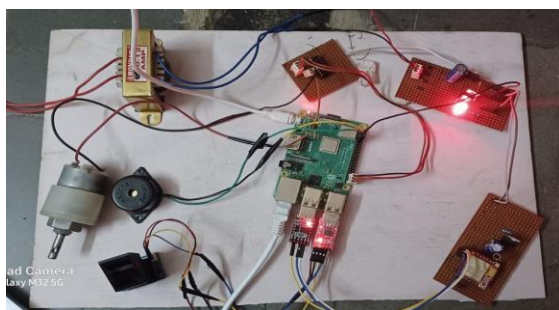
III. BLOCK DIAGRAM



IV.FLOW CHART



V.RESULT AND DISCUSSION



The proposed system smartly detects that whether the person outside the door is the owner or a case of

possible intrusion. If it truly detects the person as the member or owner using the fingerprint, a SMS will be sent to remaining owners and it unlocks the door without much intervention of the owner. If an intruder is detected, the system immediately alerts with the buzzer, a SMS alert will be sent to the appropriate person and breaks the process.

VI.ADVANTAGES

Improved safety.

- It can only be opened when an authorized user is present.
- No keys to be lost, stolen or occupied.
- Gives an indication for unauthorized entry.

VII.DISADVANTAGES

- Cost effective.
- A biometric security locker does not easily breakdown especially those that are made from quality materials and manufactured by well-known companies.

VIII.APPLICATIONS

- Time and attendance
Businesses and corporations, at all levels of industry, served, have to keep track of the hours their employees have worked
- Logical access control
This market application refers to gaining access to a computer network either at the place of the business or corporation or via a secured remote connection from a distant location.
- Physical access entry
Once the identity of an individual has been confirmed by either their fingerprint or through the shape of their hand, the lock strike will, within seconds, open the door to the secure area.
- Law enforcement
Law enforcement agencies across all levels of the Federal Government are also starting to use Biometric Technology to confirm the identity of any suspects or wanted felons. It has been traditionally Fingerprint Recognition which is the most widely used modality.

IX. CONCLUSION

This project aimed to implement fingerprint-based door unlocking system using the Raspberry Pi. To provide security, the proposed system lets the owner control the door unlocking mechanism using his fingerprint. The system is controlled by Raspberry Pi board which operates and controls the door unlocking mechanism. It also alerts the neighbors using the buzzer sound and an SMS is sent for an intruder trying to access. Thus, the system prevents break-in and stops intrusion.

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