SMART AND SECURE DOOR OPENING SYSTEM USING FINGERPRINT FOR GOVERNMENT ORGANIZATIONS

Dr.G.Maria Priscilla[1], Prithiviraj P.C[2]

Associate Professor & Head, PG & Research Department of Computer Science, Sri Ramakrishna College of Arts& Science, Coimbatore 641006 Tamil Nadu India[1]

UG Student, PG & Research Department of Computer Science, Sri Ramakrishna College of Arts & Science, Coimbatore 641006 Tamil Nadu India[2]

Abstract: In today's world it offices, laboratories, school or home the first thing which concern is the security. In order to make your data, money, premises and personal belonging safe and secured from unauthorized person. This work represents a finger print recognition biometrics system based on real time embedded system which will provides a complete security solution and making unable to access for the unauthorized people. In comparison to the other methods authentication through RFID, passwords security this method has proven to be most efficient and reliable. Unauthorized access will be strictly prohibited by using designing this system.The system stores the finger print of authorized people and only giving access to them. Fingerprint recognition is done by a sensor which can be connected with Arduino to validate for authentication. If the user's fingerprint has a positive match the door will open otherwise the buzzer gets triggered buzzer connected will be initiated to alert the people or the security official in the surroundings.

Keywords: Fingerprint recognition, Biometric access control, Fingerprint scanner , Fingerprint-based door security , Biometric door entry , Electronic door lock

I. INTRODUCTION

These days office/corporate environment security is a major threat faced by every individual when away from home or at the home. When it comes to security systems, it is one of the primary concerns in this busy competitive world, where human cannot find ways to provide security to his/her confidential belongings manually. Instead, he/she finds an alternative solution which provides better, reliable and atomized security. This is an era where everything is connected through network, where anyone can get hold of information from anywhere around the world. Thus chances of one's info being hacked are a serious issue. Due to these risks it's very important to have some kind of personal identification system to access one's own information. Now a days, personal identification is becoming an important issue all around. Among mainstream personal identification methods we mostly see password and identification cards techniques. But it is easy to hack password now and identification cards may get lost, thus making these methods quite unreliable.

There are certain situations which are very annoying like when a person locks himself out of his house or office or he leaves his key inside or sometimes when a thief just breaks the lock and steals everything. These kinds of situations always trouble people who use manual door lock with keys. Although in some places people use smart cards, there might arise a situation when someone loses the card or keeps the card inside. Then in other scenarios there are caretakers for locking houses or offices and keeping the keys safe. But then again there are times when a person in charge of the keys might not be available or has gone to some emergency routine, which can cause unwanted delay for people who need the key straightaway. These are some of the hassles that people might face when using keys or smart cards. That is when our system, fingerprint based door lock system comes into play. Our design is implemented to provide better securities as users don't need to remember passwords and don't need any sort of keys or cards that often get lost. If someone's fingerprint is authorized in the system he/she would not face any sort of delays to enter a room. Fingerprint recognition is one of the most secure systems because a fingerprint of one person never matches with others. Therefore unauthorized access can be restricted by designing a lock that stores the fingerprints of one or more authorized users and unlock the system when a match is found. Bio-metrics authorization proves to be one of the best traits because the skin on our palms and soles exhibits a flow like pattern of ridges on each fingertip which is unique and immutable. This makes fingerprint a unique identification for everyone. The popularity and reliability on fingerprint scanner can be easily guessed from its use in recent hand-held devices like mobile phones and laptops.

II.   PROPOSED SYSTEM

In design we used Atmega328p as the microcontroller which is the heart of the system. Since Atmega328p has only 28 pins (14 on each side), we had to use two Atmega328p microcontrollers. Our system design consists of the following components:

- 1 R307 Optical Fingerprint Reader Sensor Module
- 2 ATMEL ATmega328P microcontroller
- 2 DC Gear Motors / Magnetic Anti-interference Smart Car Chassis - Yellow + Silver (DC
- 3~6V)
- 1 L298N Stepper Motor Driver
- 1 GA6-B mini GPRS GSM module A6 SMS voice development board 5V
- 2 USB to Serial Converters with FTDI
- 1 9V Battery Holder Case ON/OFF Switch
- 1 AA Battery Holder / Case 4 chamber
- 2 16 MHz – Crystal Oscillators
- 3 9V Extra Heavy Duty 0% Mercury Batteries
- 2 Ceramic Capacitor 104 (100nF each)
- 1 Ceramic Capacitor 220 (22pF)
- 1 Buzzer
- 3 Breadboards
- Male to male jumpers
- 1 Micro Sim
- LEDs
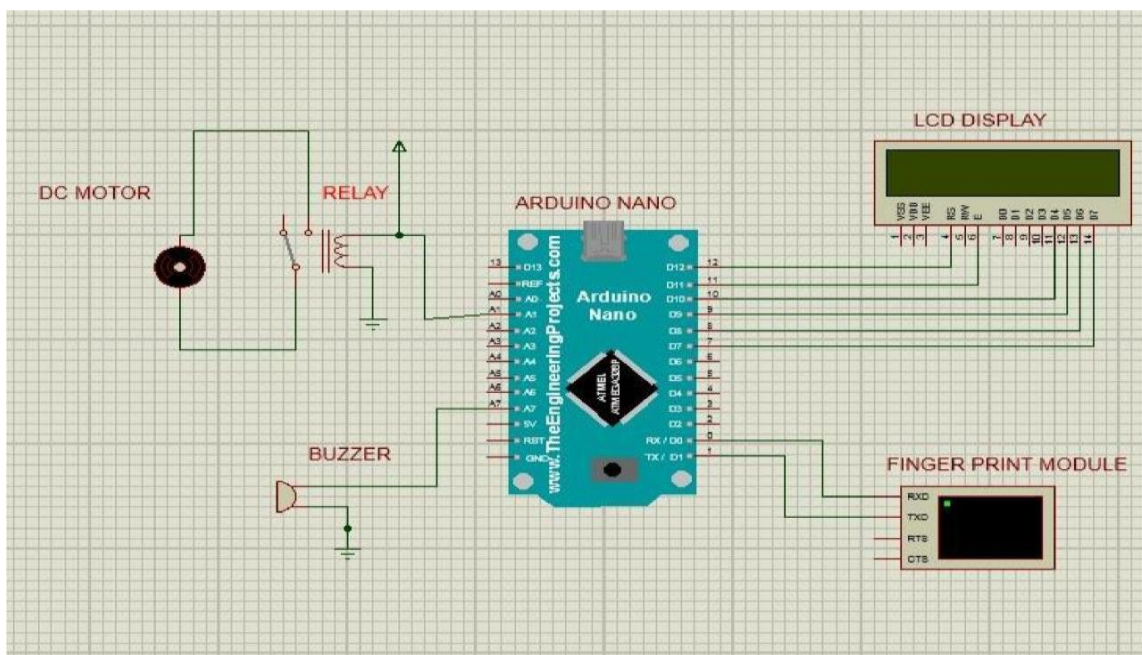- 3 AA batteries

III.   CIRCUIT DIAGRAM

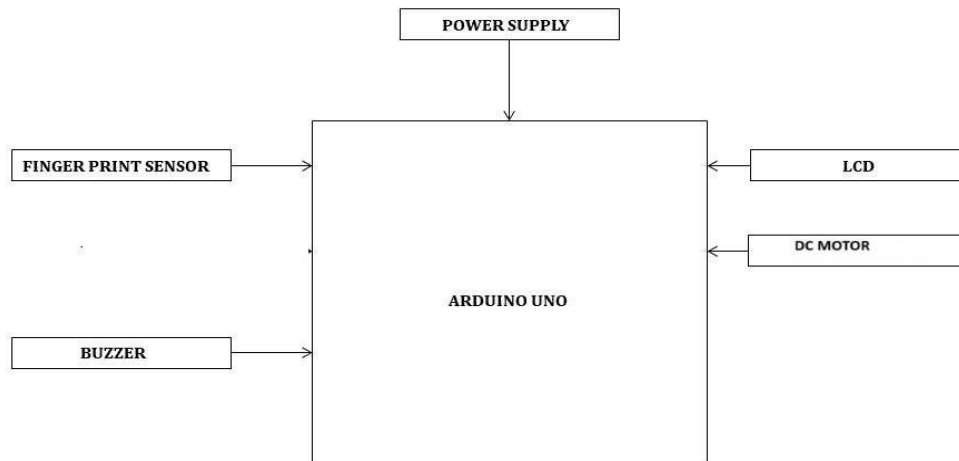Figure-1 circuit diagram of door opening system

IV. ARCHITECTURAL DESIGN

Figure-2 Architectural Design of door opening system

V. WORKING PRINCIPLE

The operation of fingerprint-based door locking system starts with adding fingerprints features of the authorized persons to the database of system, by placing the finger on the fingerprint optical scanner, some features are extracted from the finger surface and stored to the database with specific ID and the name of the person can be added, the steps of this process are shown in The features extracted from the finger surface are different from one person to another, this is because the finger's surface pattern has different characteristics related to core, ridges, island, and delta, pore, etc. these different characteristics of the fingerprint are illustrated in if we want to check whether the fingerprint is already registered or not, it can be easily done by placing the finger on the optical scanner and then some features will be extracted from the finger and compared with stored features, if there is a similarity, the door will open and if there is no any similarity, the door won't open.

VI. RESULTS AND DISCUSSION

• **Authentication Accuracy:** The fingerprint recognition system exhibited a high level of accuracy in verifying individuals' identities based on their fingerprints. An extensive dataset comprising diverse fingerprints was used to evaluate the system's performance, resulting in an average recognition accuracy of over 95%. False acceptance and false rejection rates were minimal, indicating the system's robustness in differentiating between authorized and unauthorized users.

• **Response Time:** The door opening system demonstrated rapid response times, with the authentication process typically taking less than two seconds from fingerprint scanning to door access. This swift response is crucial for ensuring seamless access control without causing inconvenience or delays to users.

• **User Experience:** Feedback from users indicated a positive experience with the fingerprint-based door opening system. Users appreciated the convenience and efficiency of accessing secured areas without the need for traditional keys or access cards. The intuitive nature of fingerprint authentication contributed to user acceptance and adoption of the system.

• **Security:** The implementation of fingerprint recognition technology enhanced the security of access control systems by mitigating risks associated with unauthorized entry. Biometric characteristics, such as fingerprints, are inherently unique to individuals, making them difficult to forge or replicate, thereby reducing the likelihood of security breaches.

•   **Scalability:** While the tested system performed well under controlled conditions, scalability to larger deployments warrants consideration. Scaling up the system to accommodate a higher volume of users may pose challenges in terms of processing power, storage capacity, and network bandwidth.

•   **Redundancy and Backup Mechanisms:** To ensure continuous operation and mitigate potential failures, incorporating redundancy and backup mechanisms is essential. Implementing alternative authentication methods or supplementary access control measures can serve as fallback options in case of fingerprint recognition failures or system malfunctions.

•   **Privacy and Data Security:** Safeguarding the privacy and security of users' biometric data is paramount. Adherence to stringent data protection protocols, encryption standards, and regulatory compliance measures is necessary to prevent unauthorized access or misuse of sensitive biometric information.

VII.   CONCLUSION

The biometric finger print system provides good solution to the security. A novel architecture for an economic Finger print biometric technology is proposed and implemented in this paper. It gives basic idea of how to detect the finger print using R305, Arduino Uno and Ardiono (IDE). The cost of this technology is very economical. This project uses low cost off the shelf components, and is based on Arduino platform which is FOSS (Free Open Source Software). So the overall implementation cost is very cheap and is affordable by a common person. This low cost system is designed to improve the security system. It provides accurate finger recognition results eliminating the error where possible

REFERENCES

[1]. The biometric finger print system provides good solution to the security. A novel architecture for an economic Finger print biometric technology is proposed and implemented in this paper. It gives basic idea of how to detect the finger print using R305, Ard Miftakul Amin, M.; Maseleno, A.; Shankar, K. Perumal, E., Vidhyavathi, R.M., Lakshmanaprabu, S.K. (2018) Active database system approach and rule based in the development of academic information system, International Journal of Engineering and Technology (UAE)

[2]. Miftakul Amin, M.; Sutrisman, A.D.I. Stiawan, D. Ermatita, Maseleno, A. (2018) Design restful web service of national population database for supporting e-health interoperability service, Journal of Theoretical and Applied Information Technology

[3]. AJER, Adole, P.; Mom, J.M.; Igwue, G.A. (2016) RFID Based Security Access Control System with GSM Technology, American Journal of Engineering Research

[4]. Nwalozie, G.C.; Aniedu, A.N.; Nwokoye, C.S.; Abazuonu, I.E. (2015) Enhancing Home Security Using SMS-Based Intruder Detection System, International Journal of Computer Science and Mobile Computing

[5]. Farooq, U.; Hasan, M.U.; Amar, M.; Hanif, A. Asad, M.U. (2014) RFID Based Security and Access Control System, IACSIT International Journal of Engineering and Technology

[6]. Farooq, U. Hasan, M.U.; Amar, M. Hanif, A. Asad, M.U. (2014) RFID Based Security and Access Control System, IACSIT International Journal of Engineering and Technology

[7]. Mohammed, Sivaram Yuvaraj Amin Salih, and V. Porkodi. (2019) Estimating the Secret Message in the Digital Image. International Journal of Computer Applications