

## Ai Based Fingerprint Access Control System

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Date of Submission: 01-11-2023

Date of acceptance: 11-11-2023

### ABSTRACT

The main aim of the project is to process the real time data acquisition under fingerprint with artificial audio intelligence and control gate with help of python programming in Computer and arduino program in atmega328 microcontroller hardware. Artificial intelligence (AI) is a wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is interdisciplinary (more than one branch of self-decision making and application controlling) science with multiple approaches, advancements. Security is one of the most important resources in this century. We should protect or save those things under security observations. Things without securities are not safe, Due to its misuse or uncertain use. So security is provided for those people, they cannot misuse for the protected area/ section. In this project we have used artificial intelligence to make project better for user with audio response.

**Keywords** – ATmega328, Finger print Sensor, LCD, Motor driver, Python

### I. INTRODUCTION

The development of science and technology will give birth to various solutions to solve human problems. Problems that arise, due to limited human abilities or from other factors, are now gradually being overcome. One of the solutions that can help human problems is by using a computer-based control system. One of them is a starting system that uses fingerprint authorization. [1]

Biometric recognition is one of the promising authenticating systems worldwide. It uses a verification process that involves biological feature like face, fingerprint, hand veins, iris, retina etc. [1]. However, fingerprint identification and verification are widely used as biometric technique due to its simplicity, distinctiveness, and long lasting properties. Fingerprint plays a great role in ensuring public security and criminal investigation including forensic investigation, law execution, tax access and public security. Fingerprint biometrics has a very high level of accuracy, because it is stated that almost all individuals do not have the same fingerprints. The fingerprint security system is very good to apply. With fingerprint authorization, only authorized persons can turn on or operate the device/vehicle. Several previous studies have been

carried out by making fence locks using the ATmega328P Microcontroller-Based Fingerprint [1]. Likewise, research on access control of room doors using fingerprints based on ATmega 328P [2] and access control of room doors using fingerprints based on fingerprints were developed with android smart phones [3]. And even safe door security using fingerprint sensor and digital password with ATmega 19 microcontroller [4]. In this our work AI based finger print access control system we have provided fingerprint samples first with finger print sensor. Atmega328 microcontroller used to sense or read all inputs and depending upon controls output. Fingerprint and ultrasonic sensors are input as person come in front of door ultrasonic detect and voice play back through audio alert play for finger scan. As we scan finger if it is valid alert play with voice play module. Gate open for 20 second in valid finger and after 20 second automatically system closes the door. Audio notifications are play while operation with voice play module. Also text shows on LCD display. In this system we have used fingerprint module R307, Motor driver, motor, power supply, voice playback module, Atmega328 microcontroller, LCD display.

The rest of the paper is organized as follows. Section II presents a review of related literature. Section III System Architecture this Section describes the main components used in the system, and explains their operation. Section IV shows the flow chart of the system it tells how system work section V which also explains the operation of the system in general and the outlines results of the project. VI concludes the paper.

## II RELATED WORKS

The use of biometric authentication systems for access control has become increasingly popular in recent years due to their high security and convenience. One of the most widely used biometric technologies is fingerprint recognition, which is based on the unique pattern of ridges and valleys on an individual's fingertip. Several studies have been conducted on fingerprint recognition systems, and various techniques have been developed to improve their accuracy and reliability.

[2]One study by (Jain, Chen, & Demirkus, 30 November 2006) analyzed the performance of different fingerprint recognition algorithms and found that the minutiae based approach, which extracts and matches minutiae points on the fingerprint, is the most reliable and accurate technique.

The use of Arduino boards in various projects, including biometric a c authentication systems, has also gained popularity due to their ease of use and affordability. Another study [3] which achieved high accuracy and reliability was by (Martin, 2018).

In [4] A Radio Frequency Identification (RFID) and password based system using Arduino UNO. RFID reader is used to read the value on the RFID ID card and the Arduino UNO. If the ID card is true, Arduino enables password to be pressed on keypad. If password is true, lock style solenoid is unlocked, but if false, solenoid is locked. Though the work used a two factor authentication, it can be compromised if the password is leaked and the RFID ID card falls into a wrong hand, quite unlike the current work.

In [5] a study by (Chugh, Cao, & Jain, 2017) proposed a new approach to detect and prevent

spoofing attacks in fingerprint recognition systems using machine learning techniques.

A research [6], designed an access control system using a one-time password (OTP) to make up the gaps of the user authentication mechanism such as mechanical door-lock. The system user must register A mobile phone and know how to use the OTP which is generated and sent to the user's mobile phone [7] whenever the user requests to gain entrance to the facility. However, this form of door access control is deficient because it is not multi factor authentication-based and users are not notified when unauthorized users try to gain access into the facility.

Furthermore, [8] presented a paper titled "Password protected electronic lock system for smart home security". The system uses a keypad, 16 x 2 Liquid crystal display (LCD) and a PIC18FA52 microcontroller [9] which enable users to get notification of an intruder on their LCD. This current work is an enhancement, as it introduces a multi-level authentication and a mobile phone alert to notify users irrespective of their location

Overall, the literature suggests that fingerprint recognition systems are a reliable and secure method of access control, and the use of Arduino boards and machine learning techniques can improve their accuracy and security

## III SYSTEM ARCHITECTURE

### 3.1 System Model

To implement the proposed access control system with the use of fingerprint recognition, we use the different hardware and software. The block diagram of the system shown in below Figure 1. In this system we have used fingerprint module R307, Motor driver, motor, power supply, voice playback module, Atmega328 microcontroller, LCD display.

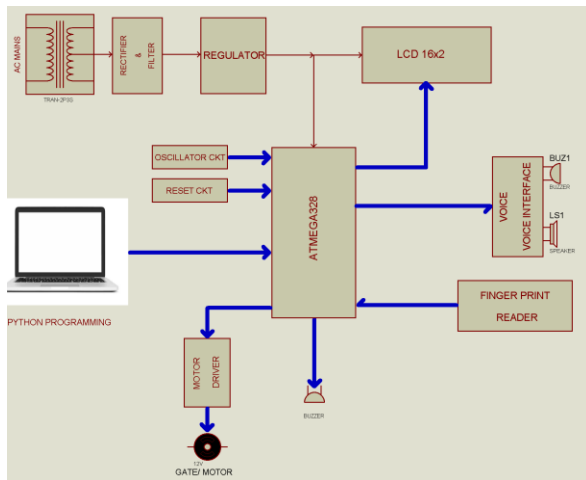


Fig.1: Block diagram of system

### 3.2 Hardware Component

#### 3.2.1 Microcontroller Atmega 328

In this (atmega328 28 pin microcontroller) works with 16MHz frequency used for (timer configuration), the unwanted frequency produced is bypassed by the capacitor of 27pf capacitor. Reset pin is connected to resistor of 10K whenever reset requires the reset switch (2 lead push to ON switch/ micro push to switch) required pressing. 6 channel 10 bit inbuilt ADC available, 6 PWM pins available, multiple serial communication available, up to 20 programmable pins available.

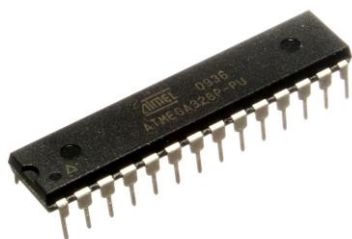


Fig. 2: ATmega 328 microcontroller

#### 3.2.2 Lcd Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying

special & even custom characters (unlike in seven segments), animations and so on.



Fig.3: LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

#### 3.2.3 Fingerprint Sensor

The fingerprint sensor is one kind of sensor which is used in a fingerprint detection device. These devices are mainly inbuilt in the fingerprint detection module and it is used for computer safety. The main features of this device mainly include accuracy, better performance, robustness based on exclusive fingerprint biometric technology. Both fingerprint scanner otherwise reader are an extremely safe & suitable device for safety instead of a secret word. Because the password is easy to scan and also it is hard to keep in mind. So, better to use USB based fingerprint reader or scanner using biometric software for verification, identification, and authentication, that allow your fingerprints to perform similar to digital passwords. These passwords cannot be forgotten, lost otherwise stolen.



Fig.4: Fingerprint Reader

This is the R307 Optical Fingerprint Reader Sensor Module. R307 fingerprint module is a fingerprint sensor with a TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can

configure it in 1:1 or 1: N mode for identifying the person.

### 3.2.4 Motor driver and Motor

Microcontroller has very low current at its output cannot drive motor directly. Motor driver L298 used to driver motor. Motor is used to construct gate open close assembly.

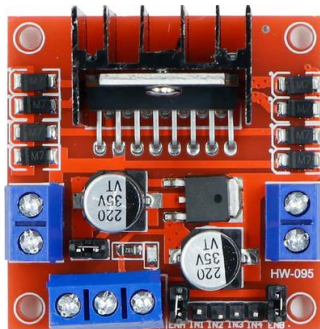
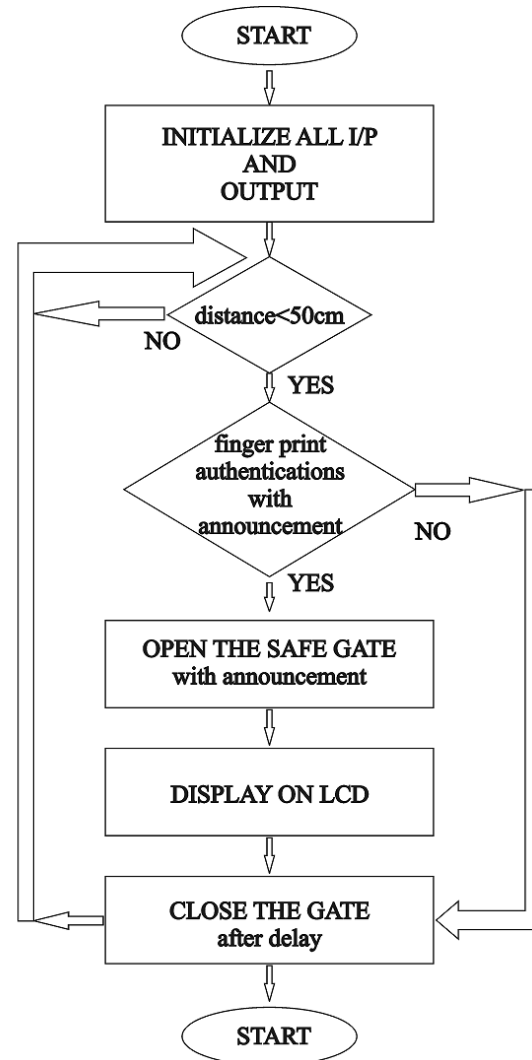


Fig. 4: Motor driver

### 3.2.5 Buzzer

Buzzer is also known as beeper. It is an audio signaling device. The types of buzzer includes mechanical, electromechanical, and piezoelectric. In this project, piezoelectric buzzer is used which alert the surrounding peoples. Some of the applications of piezoelectric buzzer includes alarm devices, timers, confirmation of user input (ex: mouse click or keystroke), electronic metronomes, game shows, sporting events and household appliances.

## IV. Flowchart



## FLOWCHART

### V Result

The working model of the proposed system is shown in fig.5. In this system we detect the doors nearby person with ultrasonic sensor and provide voice alert please scan finger to open door. After correct authorized fingerprint automatically open door for 20 second and gives voice alert after 20 seconds system automatically close the door the results are shown in the figures below.

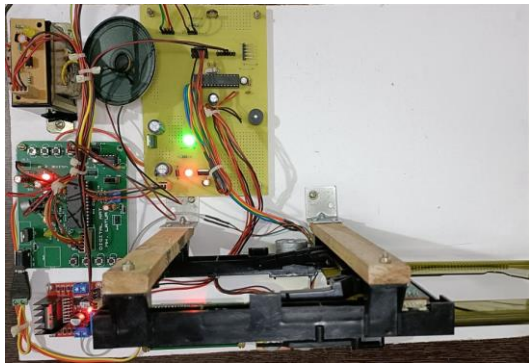


Fig.5: Working Model



Fig.11: Authorized Person



Fig.12: Gate open for 20 sec



Fig.6: The first step of process

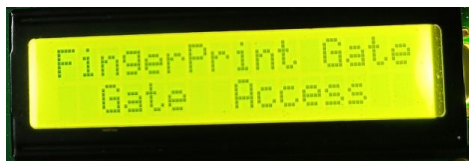
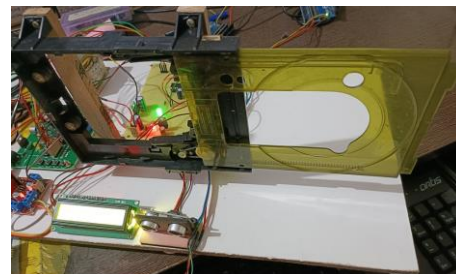


Fig.7: The second step of process



Fig.13: Provide voice alert Gate is close

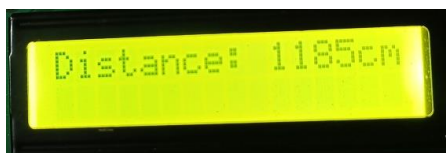


Fig.8: The distance greater than 50 cm



Fig.9: The distance less than 50 cm



Fig.10: Provide voice Alert

## VI Conclusion

After testing the system developed, we came to know that AI based finger print access control system can be efficiently used with fingerprint recognition. Fingerprint images cannot be recreated from templates hence no one can misuse the system. Speed of execution can be enhanced with the use of more sophisticated microcontroller.

This system is the integration of hardware, software, and biometric technology to create a secure and efficient access control solution. The advancements made in this project contribute to the growing field of biometrics and highlight the potential for further innovation in this area.

## Acknowledgements

We convey our sincere thanks to the Principal prof. B.V.Dhame, Dean of P. G. Department Dr. Suresh R. Halhalli and staff of

M.S.Bidve College of Engineering, Latur for help in carrying out this research work at the institute.

Computing, Communication and Conservation of Energy (ICGCE), Dec - 2013.

## REFERENCES

- [1] Atmega328p microcontroller based biometric starting system design for caterpillar D3k dozer heavy operators GSC Advanced Research and Reviews, 2022, 13(01), 001–006
- [2] A. K. Jain, Y. Chen and M. Demirkus, "Pores and Ridges: High-Resolution Fingerprints Matching Using Level 3 Features," in *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 29, no. 1, pp. 15-27, Jan. 2007, 11.05.2023.doi10.1109/TPAMI.2007.250596.
- [3] Martin, M., Stefan, K., & Lubor, F. (2018). Biometrics Authentication of Finger-print with Using Fingerprint Reader and Microcontroller Arduino. *TELKOM-NIKA (Telecommunication Computing Electronics and Control)*, 16(2), 75512.05.2023.doi.org/10.12928/TELKOMNIK A.V16I2.7572
- [4] Hilang S. & Lwin S. (2019). Electronic Door Lock using RFID and Password Based on Arduino. *International Journal of Trend in Scientific Research and Development*, 3(2), 799-802 <https://doi.org/10.31142/ijtsrd22875>.
- [5] T. Chugh, K. Cao and A. K. Jain, "Fingerprint spoof detection using minutiae-based local patches," 2017 *IEEE International Joint Conference on Biometrics (IJCB)*, Denver, CO, USA, 2017, pp. 581-589, accessed 12.05.2023. doi: 10.1109/BTAS.2017.8272745
- [6] Shin, S. S., Han, K. H., & Jin, K. Y. (2013). Digital Door Lock on the Access Control System using OTP-based User Authentication. *International Journal of Digital Content Technology and its Applications*, 7(11), 436. <https://doi.org/10.4156/jdcta.vol7.issue11.56>.
- [7] Mohsen G. and Satar G. (2016). One-time password via SMS. *Bulletin de la Societe Royale des Sciences de Liege*, Vol 85, pp106-133.
- [8] A. Verma, "A Multi-Layer Bank Security System," *International Conference on Green Computing, Communication and Conservation of Energy (ICGCE)*, Dec - 2013.
- [9] R.Ramani, S. S. S., November 2012. Bank Locker Security System based on RFID and GSM Technology. P.Niranjana, Bank Locker Security System based on RFID and GSM Technology, *International Journal of Computer Applications* (0975 – 8887), 57(18), pp. 15-20.
- [10] Dutta M., Islam M.A., Mamun M.H., Psyche K.K., Mamun M.A. (2020) "Bank Vault Security System Based on Infrared Radiation and GSM Technology." *Data Communication Technologies and Internet of Things*. (ICICI 2019), vol 38. Springer, Cham.
- [11] Neelam M., Ruhinav H. and Priyanka B. (2016), Automatic Door Locking System. *International Journal of Engineering Development and Re-search*. Vol 4 (1), 495-499.
- [12] Fingerprint Sensor accessed 11.05.2023. <https://www.farnell.com/datasheets/321619>.
- [13] Wikipedia

## Thesis:

- [14] Sharmin Yasmin Fingerprint Door Lock System Using Arduino vaasan Ammattikorkeakoulu University of applied sciences information technology (2023).