



Arduino Fingerprint Door Lock Systems

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ABSTRACT -

Fingerprint door locks are increasingly popular due to their convenience and improved security compared to traditional locking systems. This project aims to explore and implement a robust approach to improve the security of fingerprint door locks.

Through an analysis of existing literature and technological advancements, this paper aims to provide insights into the effectiveness and prospects of fingerprint door lock systems.

Index Terms – Solenoid Door Lock, Arduino, Fingerprint sensor.

I. Introduction

In recent years, advances in biometric technology have revolutionized the field of security systems. Lock systems have been around for centuries, and traditional locking systems are still used today.

The development of technology has led to the development of advanced door locking systems that are safer and more convenient than traditional locking systems. Fingerprint door lock systems are becoming increasingly popular because of their safety and convenience.

This article explores the development of fingerprint door lock systems, examining their mechanisms, advantages, disadvantages, and effectiveness in securing access points.[1], [2]

Project Overview:

- Aim:** To ensure fingerprint security using Arduino and fingerprint sensor, you need to connect the fingerprint sensor module to the Arduino microcontroller board.
- Objective:** To Familiarize with a smart door locking system based on a microcontroller and use Arduino to create a simple and smart door locking system.
- Problem Statement:** Design and implementation of a secure door lock system using Arduino UNO microcontroller and fingerprint sensor. The system must allow authorized users to unlock the door by scanning their registered fingerprint, while denying access to unauthorized persons.

Methodology and Design:

- Hardware configuration:** Arduino board (such as Uno) (such as Adafruit Fingerprint Sensor) Fingerprint sensor module access is allowed or denied via LED.
- Connection:** Using a jumper cable, connect the fingerprint sensor module to the Arduino board.
Connect the LED to the Arduino digital pin to signal whether access is allowed or prohibited.
- Software configuration:** Install the required libraries of the fingerprint sensor module.
- Code implementation:** In the setup () function, initialize the fingerprint sensor module and serial communication.
Implemented the feature of comparing captured fingerprints with registered fingerprints to verify fingerprints.
Enable the LED to signal that access has been granted if fingerprint verification is successful.
- Reviews and improvements:** Arduino board with code. Fingerprint registration and access verification will test the system.
The code should be improved when necessary to increase functionality or add new features.
For further verification, save the fingerprint registration data to the module's memory.

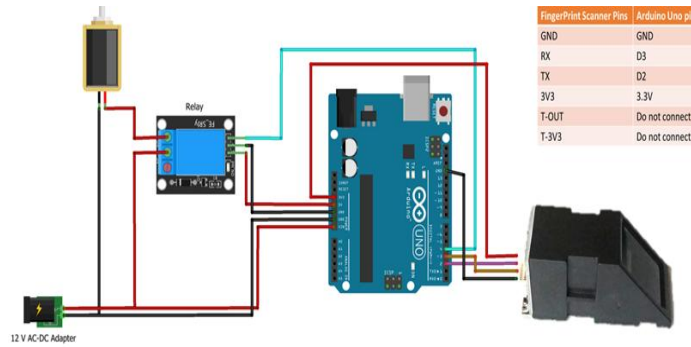


Fig. 0 Block Diagram of The Set-Up of The Connections

II. HARDWARE PROTOCOL

A. Arduino UNO:

The board is equipped with sets of input pins Digital /output (I/O) and analog devices can be interfaced to multiple expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six of which are capable of outputting electrical pulses), 6 analog I/O pins and is programmable with the Arduino IDE (integrated development environment), via USB type B cable.[3]

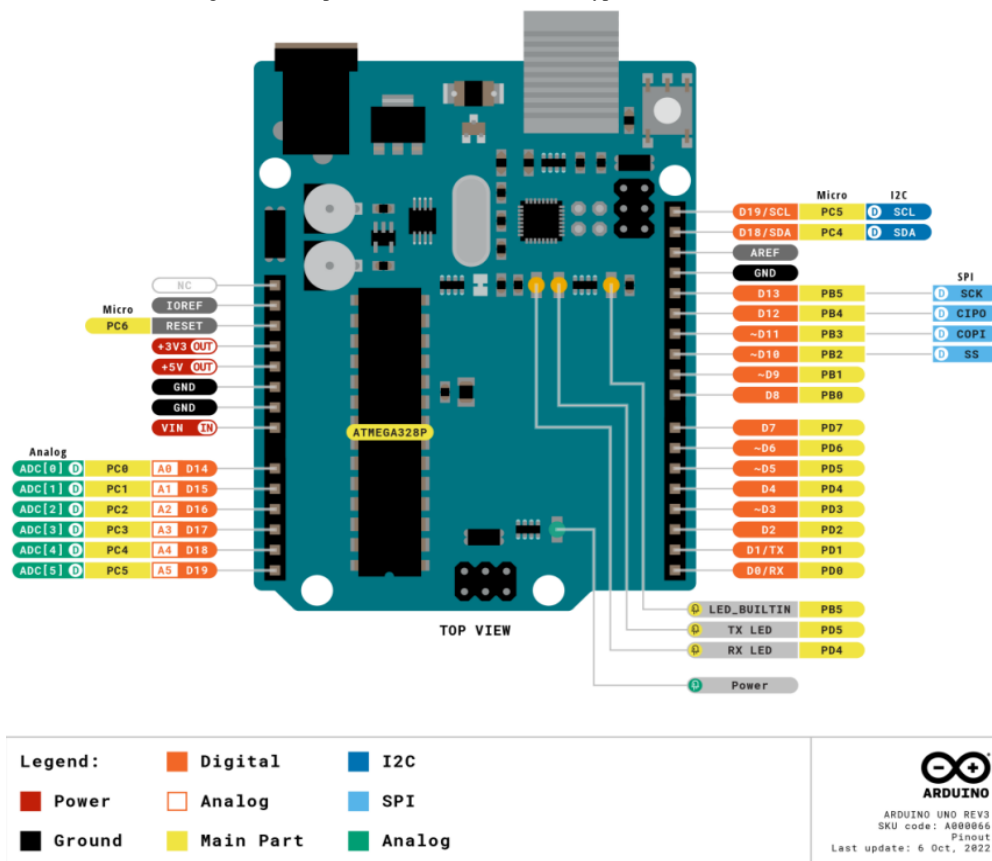


Fig. 1 The Arduino Pinout Diagram (Arduino 2022).

Fingerprint Sensor:

The fingerprint module includes an optical fingerprint sensor, high-speed DSP processor, high-performance fingerprint alignment algorithm, high-capacity FLASH chip and other hardware and software components, performance Stable, simple structure, with fingerprint input, image processing, fingerprint matching, pattern search and storage and various other functions.[3]

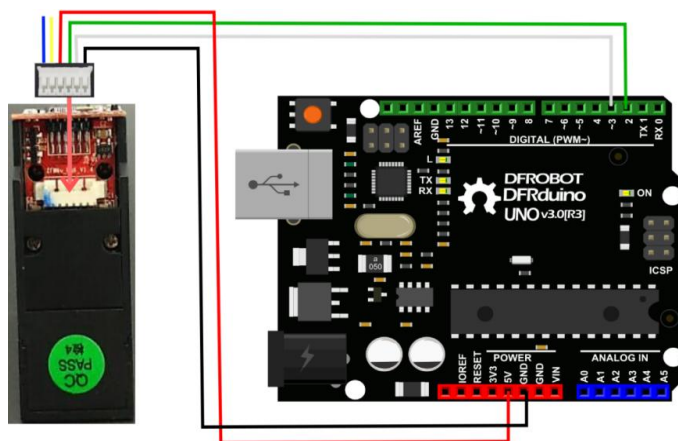


Fig. 2 The Connection Diagram of a Fingerprint Sensor (Farnell, 2023)

Solenoid Door Lock:

The electromagnetic lock is a compact and robust locking mechanism designed for a variety of applications requiring secure access control. The locking mechanism is designed to securely hold or release the latch or latch, thereby providing a reliable locking and unlocking mechanism.[1]

Relay:

The electro-mechanical device acts as a switch. DC electrical current is used to energize the relay coil which opens or closes the contact switches. Internal circuit of a single channel 5V relay consists of normally open contacts, normally closed contacts and a coil.[3]



Fig. 3 Relay module (Farnell, Embedded Development Kit, 2022).

Software Description:

Numerous software programs, including Vision5, Microchip Studio for AVR (SAM Devices), Arduino, and others, are open source.

A programmer can use any of these software packages to accomplish the desired task (for programming, writing source code instructions), but each one has its own Integrated Development Environment, coding style, toolbar features, library.

Arduino (IDE) The free and open-source Arduino IDE makes it simple to write code and upload it to the board of your choice. [4], [5]

The Arduino Integrated Development Environment, or Arduino software, comes with a text editor for writing code, a message box, a text panel, a toolbar with buttons for common functions, and a numeric menu (IDE).[6]

III. Applications

- I. Used in Banks and Offices to secure the vaults door or simply for residential houses door lock system.
- II. Fingerprint security system can be used in ATM, fingerprint operated Vehicles.
- III. Can be used for voter ID registration. [7]

IV. Results and The Conclusion

Fingerprint door locks are a big investment for home or business. It provides excellent security by providing restrictions against unwanted access. This device increases the level of security by adding unique biological characteristics of the authorized person. For those who want more security than for their home, the fingerprint door lock system is the best choice.[8]

We have covered hardware configuration, software implementation, and important factors for successfully deploying the through the methodology outlined in this project.

The technology ensures only authorized people can enter by registering fingerprints and implementing a verification mechanism. The user experience is enhanced by including visual indicators, providing quick feedback as to whether access has been granted or denied. [9], [10]

An additional line of defense against unauthorized access attempts is provided by incorporating security measures, such as saving recorded fingerprint data and implementing a timeout mechanism.

v. Acknowledgment

“The Smart Fingerprint Authentication System based on Arduino”. The fingerprint lock system is a lock system that uses the fingerprint sensor module to secure the user's fingerprints.

The fingerprint sensor module uses Arduino or Raspberry Pi to operate them. In the proposed system, there is three-level security. Users are faced with two levels of security to unlock the system. This is the ideal choice to avoid the hassle of stolen or lost keys or illegal access.

Authorized user must register his fingerprint in system. The registered person's mobile number is then added to GSM and a permanent picture password is assigned to the person use this.

First, the unauthorized person must select the unauthorized user. Administrator received a random image. That person must choose the correct image at random. Otherwise, the system will return to the first page.[11], [12]

A “smart door lock system using IoT” The Internet of Things, or IoT, is a wireless link that operates within of a door lock.

Using IoT-enabled applications, users can unlock their doors with their smartphones. Servo library is introduced after developing application by creating a string variable containing a unique device ID for the latch.

The basic concept behind the working of the door lock is the identification code provided by the Android phone through the created application.

A “security system based on the Knock model using Arduino and GSM communication”.[5]

This system, consisting of Arduino, GSM module, servo motor and other components, uses the “secret keystroke scheme” which only the owner of the safe, luggage or any other asset I don't know what other products or objects are on there, after a device is mounted. To open the lock, keystroke pattern must only be used in a certain position, pattern is known only to the owner.[10]

The secret pattern can only be changed after the secret move is unlocked. Since there is no key to copy, this method completely eliminates the duplicate worry of.

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