Smart Door Lock

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Abstract—

A fingerprint door lock utilizes an electronic locking system to gain access. It is a type of intelligent lock with which you don't have to have a key or a magnetic card to be in your possession when entering locked premises. Instead, you will present a registered biometric fingerprint.

Keywords— Arduino, Fingerprint sensor

Introduction

From earlier times, security was and also till now is an issue of concern in our households and also in office, shops, etc. Everyone has a fear of unauthorized person entering to their home or office without their knowledge. The normal door can be fitted with locks which are capable of breaking with the use of an alternate key. Alternatives to this system can be found like the password or pattern system in the locks which again has the possibility of getting exposed and opening the lock. So, a solution to such problems can be by combining door lock with biometrics. Biometric verification is any means by which a person can be uniquely identified by evaluating one or more distinguishing biological traits. Unique identifiers include fingerprints, hand geometry, earlobe geometry, retina and iris patterns, voice waves, DNA, and signatures. Here we will use fingerprint for biometric verification as it is one such thing which is unique to every individual and the use of fingerprint as the key to door locks can overcome the security problem of unauthorized people trespassing to our homes, shops, offices, etc. to a great extent as duplicacy in such key is not possible. Also, this system will not lead to problems like losing keys because we do not require carrying keys if this system is used instead of traditional locks. So, using Ardino we will try to implement the system with features which will increase the security level.

Literature Survey

1] Fingerprint sensor door locks are a type of electronic lock that use biometric technology to unlock a door. They work by scanning the unique fingerprint of the user and comparing it to a database of stored fingerprints. If the scanned fingerprint matches a stored fingerprint, the lock will unlock, allowing the user to access the door. Fingerprint sensor door locks are becoming increasingly popular as they offer a high level of security and convenience. They are also more difficult to bypass than traditional mechanical locks, as they do not rely on keys that can be lost, stolen, or copied. Additionally, they can be programmed to allow access to multiple users, making them a convenient option for households or businesses with multiple employees or residents which means one lock but multiple unique keys. An enhanced method of executing and designing of a fingerprint door lock using GSM technology, alarm system, monitoring camera and password system. This Security system provides various security features like limiting unauthorized people access and keeps a record who ever passes through it. In case if any burglars try to break the door, an alarm system is set to alert the nearby people at that surrounding. A GSM module is used to send SMS to the owner and a web cam is used to take video of who tries to break the lock. A fingerprint scanner R305 is interfaced with Arduino microcontroller-ATMEGA328P to control the locking and unlocking process of a door. The LCD panel displays some basic commands to instruct the users. If any unregistered user places his finger in the sensor, then automatically their access will be denied. In places like home, offices, banks, hospitals, and in other governmental and private sectors, the above proposed door lock security system can be used. When compared to other projects like RFI and password, this security system has shown competitive results when tested.

2] Due to easy access Fingerprints are considered as a unique identification of a person and one of the best and the fastest method used in biometric identification systems. They are so secure and reliable to use as they are so unique and doesn't change for one in a lifetime. Fingerprint recognition using minutiae matching technique is cheap, reliable and accurate up to adequate limits. Fingerprint matching based on minutiae matching is used in this thesis work. Our algorithm also takes into account region and line structures that exist between minutiae pairs unlike other conventional minutiae matching

algorithm. For resulting in stronger certainty of matching minutiae, more structural information of the fingerprint is to be accounted. Since most of the region analysis is preprocessed, it doesn't result in making the algorithm slower.

3] Passwords and Tokens are highly vulnerable and are at high risk of being stolen or lost. One of the main reasons for security and data breaches is a weak password. Even strong passwords are being attacked by hacker attacks. Resetting the password requires a lot of time and may delay the productivity of the employee. It can be resolved by using biometrics. It is a practice of identifying or verifying the individuals based on their unique physiological or behavioral characters like the iris, fingerprints, facial pattern, DNA, Voice patterns, etc. The idea of identifying people on the basis of fingerprints can be traced back to thousands of years. It first came into practice in around 1970. The Fingerprint identification process is of identifying and verifying the fingerprints.

Modeling and Analysis

The main focus of the modeling and analysis is to provide a detailed report on the modeling of the report. In this section we present the flowcharts and algorithm to show the analysis and the glimpse of our research work. This contains very useful information regarding the modeling of the research. In this we have made an app named.

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. The Arduino integrated development environment (IDE) is a cross-platform application (for Microsoft Windows, mac OS, and Linux) that is written in the Java programming language. The Arduino Software (IDE) makes it easy to write code and upload it to the board offline. We recommend it for users with poor or no internet connection. This software can be used with any Arduino board. The solenoid lock is controlled by Arduino, it generates the signals so the lock turns on and off after the delay of a second.

The lock is not directly connected with the Arduino instead of it we use a relay module. You can find these types of locks on the doors, safes, and cupboards nowadays. you need to interface one relay. As the lock works with electricity so in case of power failure the lock can't be opened or closed. You can use different sensors with it to make a high-security lock system. The solenoid lock needs a 12-volts DC supply for its functioning so you have to provide it. Unlike manual locks, a solenoid lock is more secure as it works on electricity.

The fingerprint sensor we are using is an Optical Type, there exists two more types of sensors like capacitive which can be found in smart phones and ultrasonic ones, which are yet in testing phase, and both these options are expensive, so we will focus on this optical type for this hobby electronics and similar few features of this sensor are as following:

- Power supply: DC 3.8V-7.0V
- Average searching time: <1s (1:500, average)
- Security level: 5(1, 2, 3, 4, 5(highest))
- Working Environment: Temp: -20°C to +60°
- Touch area dimension: 14.5*19.4 mm

Flow chart:
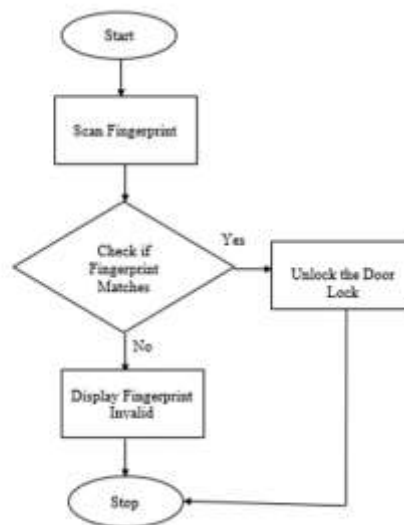
Algorithm:

Step1: Start

Step 2: Scan Fingerprint

Step 3:

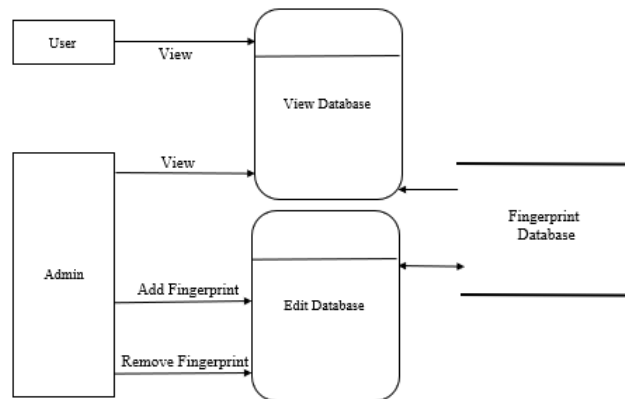3.1: Check if fingerprint matches or not if yes unlock the door

3.2: Check if fingerprint matches or not if no display "Invalid Fingerprint"
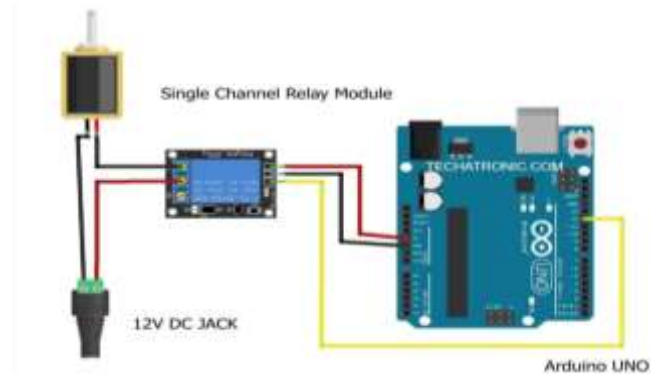
Step 4: Stop

Level Zero DFD:

Level One DFD:

Circuit diagram for the project

12v DC solenoid lock

Conclusion

Fingerprint door locks are a revolutionary technology that is rapidly gaining popularity in the security industry. With the increasing demand for security, traditional lock and key systems are no longer enough to ensure the safety of homes and offices. In contrast, fingerprint door locks offer several advantages that make them a preferred choice over traditional locks.

One of the primary benefits of fingerprint door locks is their high level of security. Unlike traditional locks that can be picked or forced open, fingerprint door locks are nearly impossible to bypass as they require a unique biometric authentication. This ensures that only authorized individuals have access to the protected area, thereby providing enhanced security. Another benefit of fingerprint door locks is their convenience. With traditional locks, keys can be easily lost or misplaced, leading to costly replacements or lockouts. In contrast, fingerprint door locks eliminate the need for keys altogether, allowing for quick and easy access without the hassle of carrying or searching for keys.

Moreover, fingerprint door locks offer a significant advantage over other types of electronic locks, such as keypad locks or card access systems. These systems can be vulnerable to hacking, and codes or cards can be stolen or duplicated, compromising the security of the protected area. In contrast, fingerprint door locks use biometric authentication, which is much harder to replicate or manipulate, providing a more secure option.

The potential for smart door locks, including fingerprint door locks, is vast, and they are expected to become increasingly prevalent in the coming years. With the development of the Internet of Things (IoT) and home automation, smart locks can be integrated into a wider home security system, providing remote access and control through mobile devices.

In conclusion, fingerprint door locks are a reliable and convenient security solution that offers a significant improvement over traditional locks and keys. With enhanced security, convenience, and potential for integration with smart home systems, fingerprint door locks are poised to become a ubiquitous feature in modern homes and offices.

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