

FINGERPRINT DOOR LOCK SECURITY SYSTEM

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Abstract-The creation of a door entry system comprises a variety of features, ranging from a simple keypad to smart cards and biometrics. The Door Access System – Arduino Based was created to address the problems with existing systems in terms of system upgrades and maintenance. The door entry system utilizing Arduino is the subject of this study. The Arduino microcontroller is a type of microcontroller with its own programming language. It comes with its own electronic prototyping platform for experimentation. Magnetic solenoid lock module and LCD display are the outputs. Based on the accuracy results achieved by completing a test on five individuals with four different fingerprints, interfacing all inputs and outputs with Arduino produced correct results in accessing the door. The minutiae collected by scanning fingerprints are clarified as inputs, while the result displayed on the LCD display is the output, and solenoid lock module locks and unlocks the device. This project is trustworthy because it may improve the security of a door access system by using a simple approach such as Arduino.

Index Terms- fingerprint, Door Access System, biometrics, smart cards

I. Introduction

The use of a door access system is commonplace all around the world. It is a sort of security system designed to protect people and assets in a building against unwelcome situations such as burglaries and kidnapping. Features or hardware such as a keypad, smart card, RFID card, and biometric are used to create a door entry system. Apart from hardware, software is also used in the development of door access systems since it aids in the interfacing of hardware and the creation of the required system flow.

PIC language programming, Mat lab, Microsoft Visual C++, Arduino, and many other types of software or programming languages are employed in this system. The Door Access System – Arduino Based is developed using a keypad and a fingerprint scanner in this paper. These two characteristics were picked because they are more user-friendly, clever, and secure than other features like face-verification, smart cards, RFID cards, and so on. A fingerprint scanner is a type of biometric sensor that detects and recognises a human fingerprint. Voice recognition, facial recognition, fingerprint recognition, and other human body part identification are only a few examples of biometrics. Despite the benefits of discovering intra and interdependencies, this approach has been shown to be inefficient because it takes 6 seconds to make a choice when the goal is 2 seconds. The fact that the technology is time-consuming was also stated in Ibrahim's journal on the face-recognition system. This mechanism is highly sensitive to facial expression and ageing. It's also inconvenient for experimental work because multiple faces must be photographed from nine different perspectives. The reason for this is that it needs to create a speech model in which users must pronounce the text according to the instructions. During experimental work, the elements that must be considered are the illumination and the fingerprint scanner employed in this research.

Sweat from humans that appears on a person's finger. Implementing a fingerprint scanner result in a faster system since it can detect human fingerprints with a considerably higher degree of accuracy, which is 70% for the left thumbprint.

The rationale for this is that the accuracy of fingerprint scanners is influenced by fewer factors than face-verification, which is done by humans sweat and scratch surface of the scanner. Furthermore, the fingerprint scanner employed in this study can make a decision in under a second. Another benefit is that ownership cannot be transferred to others. When compared to other biometric characteristics, an optical fingerprint scanner is used in this project because it has greater capabilities. The scanned fingerprint's quality is extremely significant. The fingerprint sensor detects the skin types and humidity of the finger grain to produce a high-quality fingerprint. In comparison to the Arduino utilized in this project, it uses a simple interface that can be used by an advanced programmer to interface the hardware and construct the door access system. In terms of communication, Arduino is far more efficient than the competition because it communicates via USB connection.

II. LITERATURE SURVEY

[1] Using radio-frequency identification (RFID) and fingerprint recognition, we are going to present a dual lock. This locking system is so secure and reliable that it can be implemented in home, offices, school and in also in kind of organizations. In case the user lost their RFID card, using their fingerprints they are able to unlock the latches. Fingerprints and the RFID tags are accessible only to the registered user. If an unauthorized person tries to access it, a text message will be sent to the owner as short message service (SMS) using global system for mobile communications (GSM). It also captures the picture of the person using the TTL camera and will be stored in the SD card. The main component of the system is the Arduino Mega 2560 which is interfaced with a fingerprint scanner module, RFID card reader module, TTL camera, SD card module, GSM shield, and liquid crystal display (LCD) and an electric door strike.

[2] 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.

[3] In recent years, Fingerprint based authentication systems have developed rapidly. At present fingerprint based biometric system are exposed to severe attacks. When compared to different fingerprint sensors and spoofing materials, the single feature based static approach does not perform equally. We propose a static software approach to combine low level gradient features from Speeded-Up Robust Features (SURF), texture features from Gabor wavelet using dynamic score level integration and, pyramid extension of the Histograms of Oriented Gradient (PHOG) in this paper. To overcome the issues faced in dynamic software approaches which require user cooperation and longer computational time, we extract these features from a single fingerprint. By the experimental analysis done on LivDet 2011 data had resulted an average Equal Error Rate (EER) of 3.95% over four databases, while the existing best average ERR was 9.62%. Experiments were performed with Livdet 2013 and achieved an average classification error of 2.27%.

[4] 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.

[5] 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. Fingerprints identification is more popular than any other biometrics. This research paper elaborates the key features of fingerprints and the working of Automatic Minutiae Detection process and also compares the 2D fingerprint identification with 3D fingerprint identification.

[6] In the security field, Fingerprint identification which is unique and reliable is being used. Based on fingerprint door lock, we have introduced the design of remote monitoring intelligent system. This system identifies accurately lively fingerprint, when an illegal burglary is happened and sent the unlock ID information to the owner or the monitoring center of management office by the GSM network or by PSTN.

[7] Traditional door locking methods, such as smart and manual, are visible from the outside, and there is a risk of burglary. The proposed solution includes a special internal locking mechanism that is hidden within the main door and is enabled after two stages of security verification are completed. One of the security stages of the main key of finger print sensor to operate internal locking mechanism is held inside a primary (preliminary) door and is hidden from view until the primary door is opened. When the primary door is successfully checked, it can be opened with either one of the RFID-based primary keys or Bluetooth-based master keys.

[8] Traditional lock systems, passwords, and other security measures were previously used in high-security areas or bank locker rooms. These devices, however, were discovered to be insecure. RFID cards were introduced as a result of technological advances. These cards, on the other hand, were of little use to the consumer due to the risk of being misplaced, stolen, or forgotten. The aim of this research is to develop high-security solutions for such high-end security applications. The aim of this research is to create a smart

door access system that incorporates a finger print module. This system is used to limit access to only those who are approved. It is built using both hardware and software technologies.

[9] To enter through our finger print, a finger print recognition device is a security issue. A finger print scanner, such as Microsoft Fingerprint Reader, is used to identify the finger print. The most effective and accurate biometric identification method available is finger print recognition. Every individual is identified by their unique finger prints, which are used to open the lock. It's being researched the most as a biometric technology. The problems of fingerprint identification are known as fingerprint verification and identification. In areas such as security lock door systems, house entries, mobile screen locks, and so on, the finger print pattern matching is commonly used.

III. PROPOSED WORK

- Our goal is to provide a safe access control solution that can be used instead of physical keys to open doors. We propose a fingerprint-based security solution for doors.
- This design will make it simple to implement and distribute keys, and the device will be self-contained. This will improve security and reduce the need for physical keys to be carried.

The proposed system for fingerprint door lock security system is shown with the help of a block diagram in figure 1.

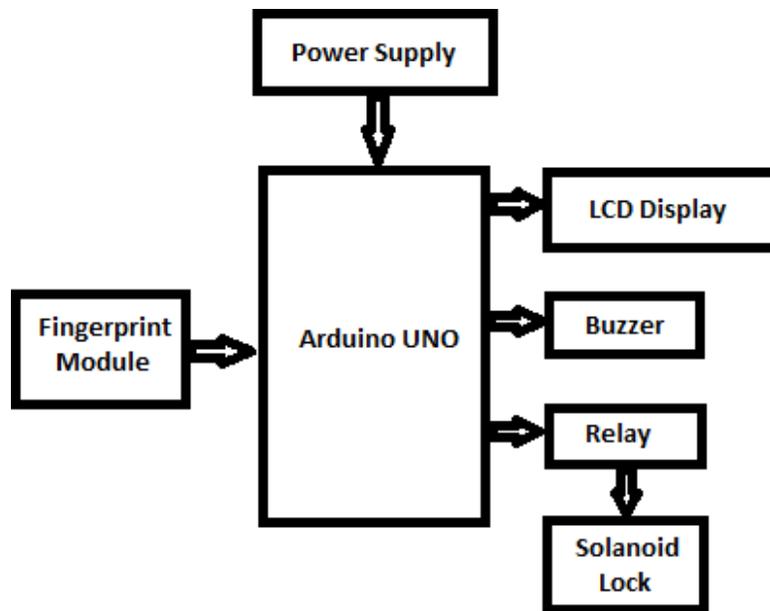


Fig. 2: Block diagram of the proposed system

A. POWER SUPPLY:

Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. A power supply may include a power distribution system as well as primary or secondary sources of energy such as Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices, Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics, Batteries, Chemical fuel cells and other forms of energy storage systems, Solar power, Generators or alternators.

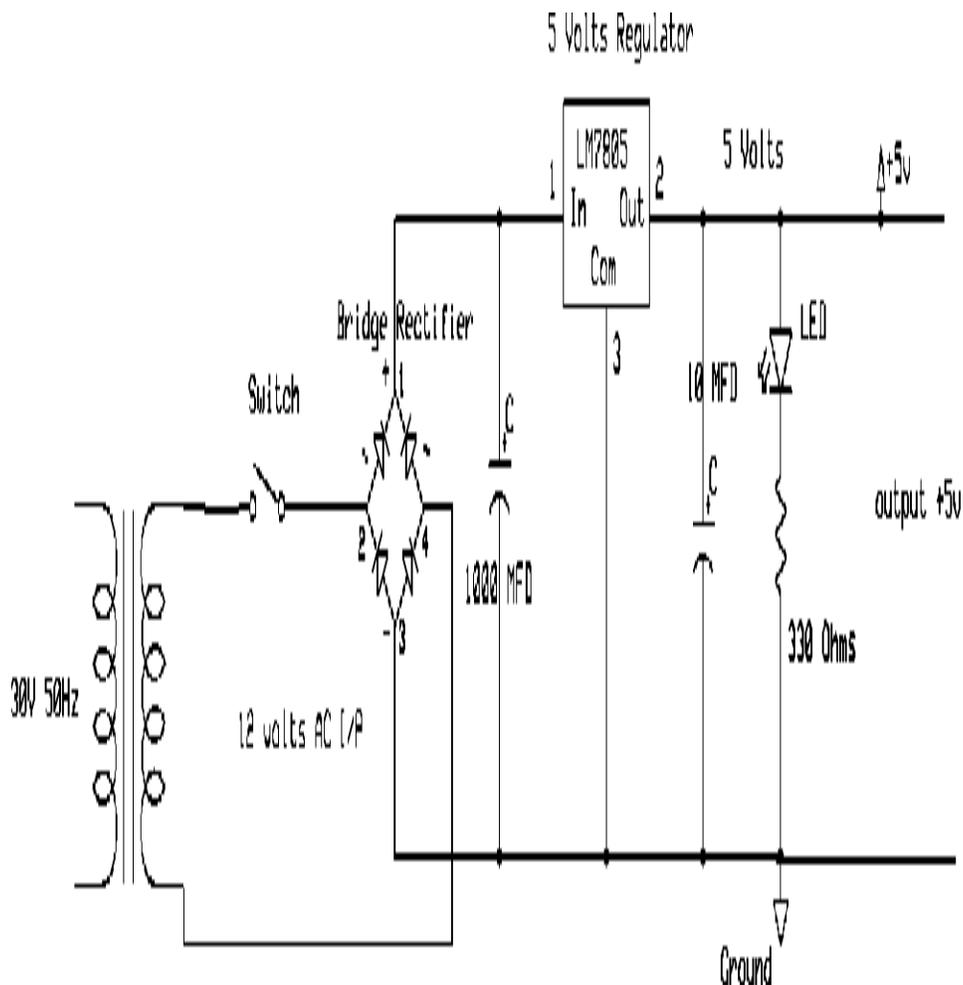


Fig2. Circuit diagram of Regulated Power Supply with Led connection

B. Arduino uno

For artists, hackers, amateurs, and many professionals, the Arduino is a family of microcontroller boards that make electronic design, prototyping, and experimenting easier. It's been used to develop new digital music instruments, as well as a system that allows your house plants to tweet you when they're dry. Arduinos (we utilise the standard Arduino Uno) are based on the ATmega microcontroller, which is a single-chip computer that has a CPU, RAM, Flash memory, and input/output connections. It's meant to connect various kinds of sensors, LEDs, small motors and speakers, servos, and other devices directly to these pins, which can read in or output digital or analogue voltages between 0 and 5 volts, unlike, say, a Raspberry Pi. The Arduino connects to your computer via USB, where you program it in a simple language (C/C++, similar to Java) from inside the free Arduino IDE by

uploading your compiled code to the board. Once configured, the Arduino may function with or without a USB connection to your computer, requiring only electricity and no keyboard or screen.

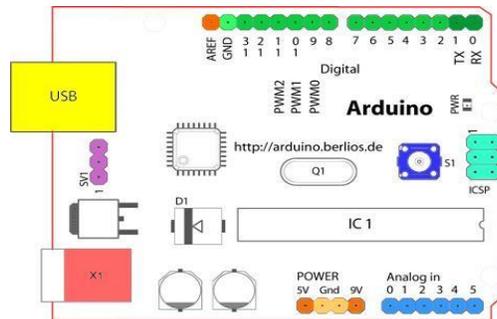


Fig 3. Structure of Arduino board

C. Fingerprint module

Fingerprint sensor module is used as a way to verify identity. This module has a rich command set for operating functions such as to enroll/verify/identify fingerprints, read/write fingerprint template file, get fingerprint image and so on. It uses UART interface (3.3V level, TTL) to communicate with external devices.



Fig 4. Fingerprint sensor0

D. Solenoid Lock Module

A solenoid is a small electromagnet that pushes or pulls a plunger that can operate a function. In this case, it holds the strike opening closed or allows the strike opening to swing open, thus allowing the door's lock latch to open without the lock latch being retracted. The solenoid lock denotes a latch for electrical locking and unlocking. It is available in unlocking in the power-on mode type, and locking and keeping in the power-on mode type, which can be used selectively for situations.

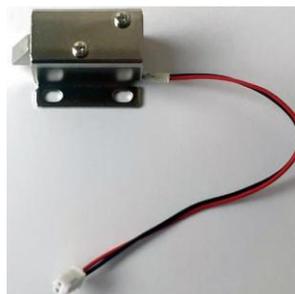


Fig 5. Solenoid Lock Module

E. Liquid Crystal Display

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-V_{dd} is applied on pin marked as V_{ee}. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or greendiodes).

IV. RESULTS AND DISCUSSION

- A. After constructing the circuit, testing was done. Figures 3.3 and 3.4 shows the results obtained from each feature and the interfacing all feature with Arduino. During testing, the outputs obtained were displayed through serial monitor. Results for image enhancement. The LCD display is added to display the output as shown in below Figure 6. The below figure 6 shows that the solenoid lock module does locking and unlocking when the fingerprint module depicts the fingerprint patterns

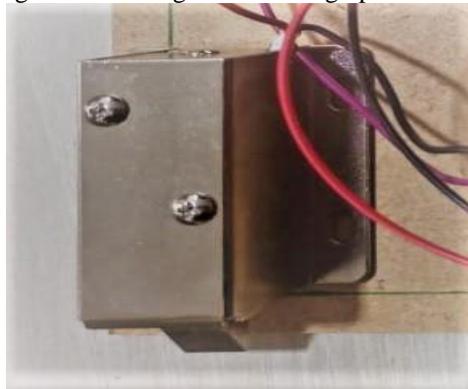


Fig 6. Output-unlocking of Solenoid lock module

V. CONCLUSION

The fingerprint module scans the fingerprint and sends it to the microcontroller, which compares it to the recorded fingerprint. The solenoid lock is unlocked when the fingerprint is matched. The results of the research enable a judgement to be drawn about the fingerprint door lock, and the following conclusions are reached after reviewing the review papers.

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