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BIOMETRIC DOOR LOCK

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Abstract— Security is becoming an important issue everywhere nowadays. Every person wants his house, factory; bank etc to be secured. House security is becoming necessary as the possibilities of intrusion are increasing day by day. In this paper, door security system has been designed that has a unique feature. Arduino was used, which is considered one of the modern programmable device. In this security system we are using a finger print sensor for a better security performance. This paper aims to develop a door security system using arduino uno, fingerprint sensor , solenoid lock , power supply, Relay module and so more . processed by Arduino UNO board which act as microcontroller unit..

Keywords— Arduino uno, fingerprint sensor , solenoid lock , power supply, Relay module.

I. INTRODUCTION

A biometric lock is an electronic and mechanical locking device that opens wirelessly with an authorized users' authentication. In a biometric home, biometric locks allow a homeowner to enter their home or provide others access without requiring a traditional key. Instead, the user uses their biometricphone or a key fob to wirelessly verify and mechanically unlock the door. Biometric locks are an extension of home automation into home security. As a connected device, biometric locks can be considered a part of the internet of things . Many biometric lock systems use mobile apps or websites to allow homeowners to grant access to third parties by sending a virtual key. Virtual keys can be sent by SMS text message or email, enabling access to guests or service personnel. Once received, these encrypted digital keys allow access to the biometric lock for a preset period of time. On top of regulating access, many biometric locks log access, providing the means to monitor use of a given secured door. Some biometric locks feature a camera, which provides a picture of those accessing the door and makes for an easily referenced photo log. Potential vulnerabilities in biometric locks do create security concerns. Security advisors recommend that biometric locks should not necessarily be thought of as more secure than a

conventional lock and key and recommend that users think carefully about settings and options.

A. Arduino Uno

Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website.

B. Solenoid Lock

A solenoid lock has a slug with a started cut and a good mounting brackrt. It's basically an electric lock , designed for a basic cabinet , sat or door . when 9-12v DC is applied , the slugg pulls in so it doesn't stick out and the door can be opened. It does not use any power in this state.

The solenoid fits in the locking mechanism and when locked , will expend so the device cannot be unlock by any force. An electromagnetic force, such as a keycard, is needed to tell the solenoid to move, allowing the device to unlock and open.

Attach the Relay in the pins of the Relay module with the digital pin 12 of the arduino as shown below . You have to connect the positive wire of the DC power supply to the other side of the relay module and the negative wire to the solenoid lock. Connect to positive wire of the solenoid lock with the Relay module.

C. Relay Module

The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

Every electromechanical relay consists of

1. Electromagnet

3. Mechanically movable contact

3. Switching points and

4. Spring

COM: common pin

NO: Normally open – there is no contact between the common pin and the normally open pin. So, when you trigger the relay, it connects to the COM pin and power is provided to the load.

NC: Normally closed – there is contact between the common pin and the normally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to the load.

II. MARKET POTENTIAL

The digital door lock systems market has excellent prospects of growth during the ongoing forecast period of 2020-2030 owing to the rising safety concerns and security issues. Owing to the ability of the market segments to grow and gain excellent revenue, the digital door lock systems market is expected to rise USD 4,15.1 million at a CAGR growth rate of 17.1% during the ongoing period 2030. There are a series of factors like the technology advancements, tech-savvy population, and the wide-scale adoption of the door lock systems providing safety, ease, and convenience that will help the market grow as per the predicted figures during the ongoing forecast period.

Digital door lock systems help in providing home security and safety for the target audience on a large scale. Also, there is a rising trend of this technology since the concept of smartphones has increased, and hence, the market has dependable prospects during the forecast period. Digital door locks are the locks that are installed as a part of the doors and can be operated with the help of the convenience rendered by the applications installed in the smartphone of the user. Also, the digital door lock systems market deals in keyless locks that look forward to their operation on technologies like wifi connectivity and Bluetooth. Hence, they have a major role to play in enhancing the customer's safety by providing full access to operation to the users who have installed these doors and the application in their homes and other places.

III. LITERATURE SURVEY

A. Brief Description of 7805 Voltage Regulator IC

A Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, "78" means that it is a positive voltage regulator and "05" means that it provides 5V as output. So our 7805 will provide a +5V output voltage.

The output current of this IC can go up to 1.5A. But, the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current. For example if the input voltage is 12V and you are consuming 1A, then (12-5) * 1 = 7W. This 7 Watts will be dissipated as heat.

B. Interfacing R307 Optical Fingerprint Scanner with Arduino Boards for Biometric Authentication

Fingerprints are one of the many unique biometric signatures we can use to identify people very accurately. But just by holding someone's hand and staring at their fingers can't be practical; we're not good at it. But computers are good at recognizing and matching patterns very fast and accurately. Before we can process a fingerprint pattern with a computer, we must "capture" it.

There exist many methods to digitize fingerprints; from forensic methods to ultrasound scanning. In this tutorial, we will learn how an Optical Fingerprint Scanner works and how we can interface the R307 fingerprint scanner

module to an Arduino board. R307 is an optical fingerprint scanner module from R30X series produced by a Chinese vendor called Hangzhou Grow Technology Co., Ltd. Other sensors in the series are R300, R301T, R302, R303, R303T, R305, R306, R308, and R311, some of which are capacitive sensors. Despite using different sensing techniques and form-factors, they all share the same interface and command set. Therefore, it is easy to adapt the library that you find here for other models as well.

C. ABOUT ATMEGA 328

ATmega328 is an Advanced Virtual RISC (AVR) microcontroller. It supports 8-bit data processing. ATmega-328 has 32KB internal flash memory.ATmega328 has 1KB Electrically Erasable Programmable Read-Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. ATmega 328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. Further details about ATmega 328 will be given later in this section.

IV. PLANNING & WORKING

A. Working

Arduino-based fingerprint door lock working is very simple and easy.

- The fingerprint sensor is interfaced with the Arduino Uno
- first, we have to enroll the fingerprint to the fingerprint sensor and saved our fingerprint sensor.
- it can save 137 fingerprints if we talk about the R307 scanner.
- it saves your fingerprint data into the inbuilt memory. and we use this data in our database.
- then we compare this saved file with every finger scanned on the scanner.

for example, if I save my finger into the database then the system will compare every single fingerprint with mine. and if it gets the same fingerprint then it will send the command to open the lock otherwise the lock will remain close.

B. Fingerprint sensor working

- Fingerprint sensor captures the image of the fingerprint and makes the pattern inside the memory of the fingerprint.
- the shape of the pattern will break into the binary code and then save into the memory of the fingerprint.
- for each and every fingerprint it will save the different patterns according to the fingerprint because as we know we all have different fingerprints even in our hand each fingerprint having its own unique fingerprint.
- it will never match the other finger and

according to the research,

- the accuracy of the fingerprint is near about 98% which is good enough to secure any system.

The Fingerprint entryway lock, as its name infers, is an electronic entryway lock that might be introduced on any passageway in your home. and it may be a good idea in the electronic projects for ece.

It utilizes a unique mark scanner by instructing the electric entryway strike to give individual access.

C. Working of Solenoid

After understanding the definition of solenoid and its parts, let us learn how solenoids work. Solenoid works on the principle of electromagnetism. When the electric current passes through the coil, the magnetic field is generated. When a metal core is placed inside the coil, the magnetic lines of flux are concentrated on the core. This increases the induction of the coil as compared to the air core. This concept is known as electromagnetic induction.

As we know, coils are made of numerous turns of copper wire wound tightly around it. A strong magnetic flux is developed when the current passes through the wire.

The concentration of flux is high on the core, while some of the flux appears at the ends of the coil and outside the coil too. By increasing the flow of electric current or by increasing the density of the turns, the magnetic strength of the solenoid can be increased.

The housing is made of iron or steel. Housing is surrounded by the magnetic field created due to the coil. The plunger lets the mechanical force do work. Solenoids too feature positive and negative poles, through which an object can be attracted or repelled.

Consider a solenoid whose length is more than the radius. Enameled and insulated wire is wrapped with a wire in the form of a helix with a small gap between the turns. The amount of vector force provided by each turn, and the total magnetic field created by the solenoid are equal to that formed by a circular loop.This gives the total magnetic field of the solenoid

V. Result

Thus our project provides new revolution in modern world. We can reduced theft in homes , offices etc, by providing full security to it. There for the antisocial crimes in the buildings , houses , offices can be controlled by our project. By implementing our project, it will be provide efficient security.

Security has always been a concern of highly importance to humans all around the world. Thanks to technology, the way people guard valuables and their homes have evolved to being safer than ever. In the present time, security involves a wide range of software that includes web based security services, biometrics and personal devices with security levels.

The introduction of biometrics into security has been one of the greatest advancements of the digital-technical age. Biometric door locks are one example of the earliest and most used systems in relation to biometrics.

The biometric door lock has a very self-explanatory name, it is a system that allows authorized people access as a result of recognizing their fingerprints, as they are a great method of identification for humans. Human fingerprints

have a lot of details and are incredibly unique. In addition it is difficult to try and copy another set of fingerprints, even to fake them and alter them. So, the fact that fingerprints are nearly always unique, makes biometric door locking system perfect with regards to security. And of course, you can hardly forget your fingerprints or even have to remember it to always carry it, in comparison to a set of keys.

VI. FUTURE PROSPECTS

Biometric verification is gaining a lot of popularity among the public security systems as well as in the commercial market. In our daily life, we witness the use of biometric in so many places such as the digital attendance system at offices, security checkpoints at airports, wearable tech gadgets retrieving our biological information, and even our national ID cards aka Aadhaar cards are created using biometrics technology. In fact, this national ID program holds the largest biometric database in the world.

In order to undertake biometric authentication, there are several methods of collecting the data. Each of these methods has its own importance whether performed separately or combined with other forms of data collection. Interestingly, some forms of biometric authentication can be performed even without the knowledge of the subject under surveillance.

VI. CONCLUSION

The system consists of Arduino and finger print sensor after scanning the fingerprint door will be opened . if the fingerprint did not matched to the enrolled fingerprint then the lock will not be open. As we put the enrolled finger on the fingerprint senor then the lock will open and this lock will remain open for 10 second , after 10 seconds this lock will be automatically closed .

VII. REFERENCES

1. https://www.indiamart.com/proddetail/arduino-uno-ch340-board-19651448730.html
2. https://www.indiamart.com/proddetail/fingerprint-biometric-door-lock-8912211062.html
3. https://www.indiamart.com/proddetail/robocraze-r307-fingerprint-reader-optical-sensor-module-time-attendance-scanner-21240930912.html
4. https://www.elprocus.com/what-is-7805-voltage-regulator-its-working/
5. https://components101.com/ics/7805-voltage-regulator-ic-pinout-datasheet
6. https://circuitstate.com/tutorials/interfacing-r307-optical-fingerprint-scanner-with-arduino-boards-for-biometric-authentication/
7. https://www.theengineeringprojects.com/2017/08/introduction-to-atmega328.html#:~:text=ATmega328%20is%20an%208%2Dbit,Pro%20Mini%20and%20Arduino%20Nano.