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Door Unlocking System using Fingerprint Sensor for Home Automation

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***Abstract* – Security is a major issue faced by everyone when we are away from our house. Smart use of various control systems for operating purposes plays a prominent role in providing the security needed. A particular door or a locker can be accessed by a person in many ways. In such a situation, a system that checks for authorization is needed to provide security for the door or the locker. In the modern era we are having many evolving technologies that provide security mechanisms. One of such mechanisms is based on the fingerprint recognition that involves abstraction of the image from the user and grant permission for accessing the door. This mechanism prevents unauthorized users from accessing the door. A validating mechanism that checks the data from a fingerprint sensor and sends an alert message to the admin user in case of continuous mismatch. The major components used to design such a security system include Arduino Uno Board, Solenoid lock, 12V Adapter, R307 Fingerprint Sensor, Tip 122 Transistor.**

***Keywords* – Arduino Uno board, R307 Fingerprint sensor, Tip 122 transistor, Arduino IDE, and Solenoid.**

I. INTRODUCTION

Biometrics refers to the automated identification of someone who supported their biological characteristics for authentication functions. The biometric technology is classified into 2 varieties which are physiological (face, fingerprint, hand, iris, deoxyribonucleic acid recognition) and behavioural (keystroke, voice, signature recognition). The biometric methodology needs the physical presence of the person. It's going to be the fingers, face, or the eyes of an individual. Not solely kinsfolk, however conjointly animals are often known based on their biometric authentication and skin patterns.

Fingerprint recognition is on the primary and original biometric technology that could be a cost-saving technique for crucial and confirming the identity of someone in numerous applications. Biometric recognition has a lot of preference over the normal technique of characteristics like the employment of passwords, pin entry, RFID cards, etc. Also, it doubtless prevents unauthorized admittance to access management systems.
These days security could be a major threat visage by each individual once they are far away from home or once a private is busy somewhere within the house. Throughout these things, there's a likelihood that somebody tries to access the door or any secret locker that is controlled within a space. Once it involves security systems, it's one in all the first issues for not having the ability to supply security for backdoor belongings manually. Instead, we can find an alternate resolution that has higher, reliable, and atomized security. In this era, everything is accessed with the assistance of technology and acquires hold of any info required. So as to interrupt this vulnerable state of affairs correct security is required. It's straightforward to hack the positive identification and identification cards might wander off, therefore creating these ways quite unreliable. The advantage of Fingerprint recognition is that they're exhausting to pretend and that they need less space for storing to store the fingerprints within the information.
The fingerprint-based door unlocking system victimization Arduino is helpful to supply security, forensics and identification of the person. Within the future there could also be applications that embrace a fingerprint-based recognition system. The entire system works beneath an easy Matching formula technique. That is employed to check the hold on templates of the fingerprints against the user fingerprints for authentication functions. Thus during this method solely licensed users will access the door or the locker.

II. COMPONENTS REQUIRED

1. Arduino Uno Board

Arduino is a software platform where hardware and code can be easy to use. These boards are used to browse inputs such as placing a finger on a sensor or a button, turning on a diode, and a message. We can guide the board in doing particular instructions by making the instructions inside the microcontroller and we can use the Arduino artificial language and IDE that contain a series of actions or steps to include the instructions.

Arduino(IDE) - contains an editor for building code, a room for storing information, a console that is used for wording, a technical bar with multiple switches for similar tasks, and a series of lists. Genuine Arduino hardware is used to transfer programs and exchange information.
A simple instrument used for a quick prototyping is developed at the Ivrea Interaction style Institute. Presently it is variably adjusting to new wants and challenges, differentiating its supply. All the boards are fully ASCII text files, empowering users to design them several, and eventually adapt them to their clear wants. It's getting bigger throughout the world because of its usage.

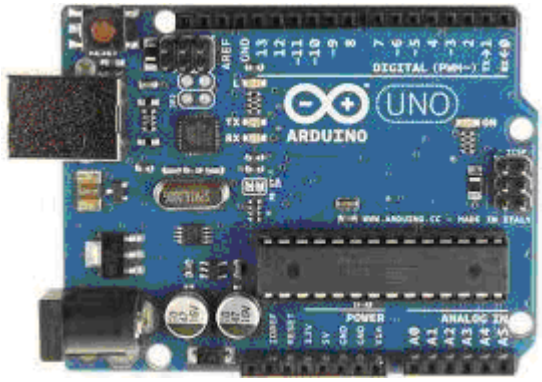

Fig.1. Arduino Uno Board.

2. R307 Fingerprint Sensor

A fingerprint is a biometric device, which is used to authenticate the user based on their fingerprint stored within the software. Fingerprints are also one of the biometric signatures which can be used to identify people accurately. Patterns present on fingers are unique and different for each individual. An optical fingerprint sensor work based on the principle of Total Internal Reflection (TIR). A glass prism is used to facilitate TIR in an optical fingerprint sensor.

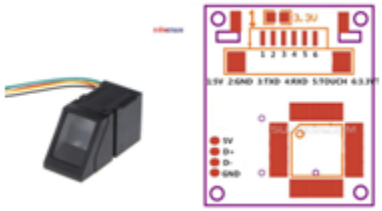

Fig.2. Schematic of R307 Fingerprint Sensor.

3. Solenoid Lock

When a door or a device is locked using a solenoid, it is using the electromagnetic forces to control the lock. The coil in the solenoid fits within the protection mechanism and once it's locked it'll expand in order that the device can't be unlocked by a force.
Fingerprints by the user are serially authenticated by the Arduino. If the fingerprint authenticates by the user matches with the predefined or saved fingerprint then the solenoid door lock opens automatically. Access will be denied by unauthorized fingerprint.

4. Tip 122 Transistor

The Tip 122 transistor is a Darlington pair NPN transistor. It has 3 pin-outs base, collector, and emitter and it functions sort of a traditional NPN semiconductor device, however since it's a Darlington pair combined it has a good collector current rating of concerning 5A and a gain of concerning 1000. It may face up to 100V across its collector- Emitter hence heavy loads could be driven by using it.

III. CIRCUIT DIAGRAM AND WORKING

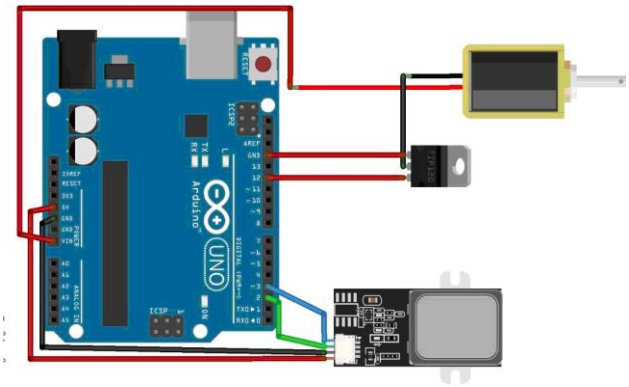

Fig.3. Circuit Diagram.

1. Working

The circuit comprises of Arduino Uno board, Solenoid lock, Tip 122 transistor, and R307 Fingerprint Sensor. The Fingerprint sensor has 4 wires Vcc, Gnd, TXD, RXD. The sensor requires 5V of positive power supply and the Vcc is connected to the Arduino 5v pin and the wires TXD and RXD are connected to pin 2 and pin 3 of the Arduino board respectively. When a user puts his/her finger on the sensor then the sensor captures the pattern of the finger and sends it to pin 2 of the microcontroller and the Arduino checks the pattern with all the patterns that are already stored in the software. Solenoid lock is connected to the Arduino board with the assistance of a Tip 122 transistor to keep up the voltage. If the pattern of the fingerprint matches one of the patterns that are already stored in the database then the signal is sent to pin 12 of Arduino where the tip 122 transistor manages the voltage and sends a signal to the pin Vin from which the solenoid lock receives an input voltage.

IV. ARDUINO SOFTWARE

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1. Cool Term Software

Cool term software uses the concept of a serial bus and provides an application of serial port to the terminal which is mostly used by all types of users for evaluating their work. It provides various options to the user like capturing the outputs and storing them in a file that can be further used to view the details. This file acts like a mini database that stores the information dynamically.

V. IMPLEMENTATION

The Arduino board is connected to the pc system with the assistance of the connecting cable and therefore the enrollment of fingerprints takes place. During the enrollment the code is uploaded to the serial monitor and thereby storing the fingerprints to the database.

The user can use their own fingerprint to unlock the door. Initially, the solenoid is in locked state. When a fingerprint is placed on the fingerprint detector, the circuit checks the entered fingerprint image with the fingerprint pictures stored within the Arduino board information. If the image matches with any of the pictures within the information then the output is distributed to pin twelve from that the locker is unbolted.

When an authorized user places his/her finger on the sensor, then the door is unlocked by showing ID and confidence of the user. If an unauthorized user tries to unlock the door then the message displays saying invalid and an unauthorized user tries more than 3 times then an alert message is sent to the admin mobile.

VI. CONCLUSION

The model and implementation of a fingerprint-based lock system can be customized according to the user requirements. This locker protection mechanism is relatively efficient than the offered lock systems within the ancient market. A system that provides high security and encompasses a high rate of accuracy is taken. In our nation, the non-public and government organizations are pretty much involved concerning the security aspects and plenty of firms have an interest in victimization differing types of protection mechanism, however, the system that is out there has terribly high installation price. Because of this excessive price, several tiny companies are not willing to afford such systems. Keeping in mind the worth of installation we have an inclination to be planned to develop a system that is with low-cost to very huge, very little firms and at homes and store the data of the users who accessed the lock and send an alert notification to the mobile device in case of 3 failure attempts. During this method, the event of a system that has security to the users is a lot of economical, effective, and reliable.

VII. ACKNOWLEDGMENT

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REFERENCES

[1]. Working principle of an Arduino, Abuja, Electronics Computer and Computation (ICECCO):11th international conference IEEE.
[2]. R. C. Wang, W. S. Juang and C. L. Lei, User authentication scheme with privacy preservation for multi-server environment, IEEE Communication Letters, vol.13, pp.157-159, 2014.
[3]. Jeremy Blum, “Exploring Arduino: Tools and Techniques for Engineering Wizardry”, Wiley publishers, 4th edition(2004).
[4]. P. Mercy Angelina, T. M. Sirisha “large scale Contextual recommender systems of online learning”.
[5]. Juels RFID security and privacy: A research survey IEEE Journal on chosen areas in Computing, 24(2):381–394, February 2006.
[6]. T. B. Zahariadis and A. K. Sakintzis, Introduction to special feature on wireless home network, ACM Mobile Computing and Communication Review, vol.7, no:2, April 2013.
[7]. W. Durfee, Arduino Microcontroller guide, University of Minnesota, Ver-2014.
[8]. Nikhil Agarwal, Microcontroller based home security system with remote monitoring, Department of EC engineering, MIT, Manipal.
[9]. Rupinder Singh Brar, Arduino based industrial security system using piezoelectric sensor.
[10]. M. Faundez Zany , On the vulnerability of biometric security system, IEEE aerospace and electronic system magazine, 2014.