Finger Print Door Lock using Arduino

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Abstract: *This concept which is of Fingerprint door locker is related to the security issues in the day todaylife, the physical key can be made as duplicate in very cheap cost and the key can lost somewhere or the key can steal, to overcome these issues we can use biometric security gadgets and try improvise the security much more because it can never be stolen it cannot be lost and the stealing chance of duplication are very low to break the security. From the old times the security is the big issue for the company's houses and other places and every person is worried about the security now a days. 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. The fingerprint sensor will take the fingerprint of the user and forward it to the microcontroller to match with its records. If the print matches with one of the fingerprints of the microcontroller's memory, the microcontroller will lock or unlock the latch, based on its current state. If the fingerprint do not match then nothing happen. The door lock is unlocked and the user have to retried. The system will be reset once a known print will be entered . 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 duplicate 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 Arduino we will try to implement the system with features which will increase the security level.*

Keywords: Arduino, Fingerprint

I. INTRODUCTION

These days office/corporate environment security is a major threat faced by every individual when away from home or at the home. When it comes to security systems, it is one of the primary concerns in this busy competitive world, where human cannot find ways to provide security tohis/her confidential belongings manually. Instead, he/she finds an alternative solution which better, reliable and atomized security. This is an era where everything is connected through network, where anyone can get hold of information from anywhere around the world.

Thus chances of one's info being hacked are a serious issue. Due to these risks it's very important to have some kind of personal identification system to access one's own information. Now a day, personal identification is becoming an important issue all around. Among mainstream personal identification methods, we mostly see password and identification cards techniques. But it is easy to hack password now and identification cards may get lost, thus making these methods quite unreliable.

There are certain situations which are very annoying like when a person locks himself out of his house or office or he leaves his key inside or sometimes when a thief just breaks the lock and steals everything. These kinds of situations always trouble people who use manual door lock with keys. Although in some places people use smart cards, there might arise a situation when someone loses the card or keeps the card inside. Then in other scenarios there are caretakers for locking houses or offices and keeping the keys safe. But then again there are times when a person in charge of thekeys might not be available or has gone to some emergency routine, which can cause unwanted delay for people who need the key straight away These are some of the hassles that people might face when using keys or smart cards. That is when our system, fingerprint door lock system comes into play. Our design is implemented to provide

better securities as users don't need to remember passwords and don't need any sort of keys or cards that often get lost. If someone's fingerprint is authorized in the systems he/she would not face any sort of delays to enter a room. Fingerprint recognition is one of the most secure systems because a fingerprint of one person never matches

II. PROJECT OBJECTIVES

The goal of this project is to research and analyse a suitable collection of components for developing a smart door lock using Arduino that provides excellent security and quick access.

The following are the specific project goals:

- Familiarity with a smart door locking system based on a microcontroller.
- Using Arduino to create a simple and smart door locking system.

III. LITERATURE REVIEW

Meenakshi et al. has proposed "Arduino Based Smart Fingerprint Authentication System".

fingerprint locking system is a locking system that uses a fingerprint sensor module to secure theuser's fingerprint. The fingerprint sensor module uses an Arduino or a Raspberry Pi to operate. Inthe proposed system, there is three-level security. Any two levels of security users have to face to

unlock the system. This is the ideal option for avoiding the hassles of a stolen or lost key or illegalaccess. The authorized user must register his or her fingerprint in the system. The registeredperson's mobile number is then added to GSM, and a permanent image password is assigned tothis user. As a first step, the unauthorized individual must choose unauthorized as the user type.

The admin receives a random picture. The person must properly choose the random image.

Otherwise, the system will go back to the first page.

Patil et al. has proposed "Smart Door Locking System Using IoT" The internet of things, or IoT,is a wireless link that works in a door lock. With the help of IoT-enabled applications, the usermay unlock the door with his smartphone. The servo library is introduced after the application isdeveloped by creating a string variable that contains the unique device ID for the lock. Theessential concept underlying the door lock's operation is the ID supplied by the Android phonevia the created app.

Reddyet al. has proposed "Security System Based on Knock Pattern Using Arduino and GSMCommunication". This system, which consists of Arduino, GSM Module, Servo Motor, and othercomponents, employs a 'Secret Knocking Pattern' that is only known by the owner of the safe,luggage, or other property or item on which the device is mounted. For the lock to open, theknocking pattern must be used only at a certain location, which is only known by the owner. Thesecret pattern can only be changed after the secret knock has been unlocked. Because there is nokey to be copied, this approach fully eliminates the worry of duplication.

Aim of Project:

Smart Prepaid Energy meter using Arduino and GSM can provide the solution to problems discussed. his project helps in not only automating but also for controlled managing of the energy consumed, which results in efficient usage of power. GSM modem is helpful for the message alerts and notifications needed for these purposes. The different components used are controlled by ATmega 328P microcontroller.

IV. METHODOLOGY OF THE PROJECT

This chapter will cover the details explanation of methodology that is being used to make this project complete and working well. Many methodologies or findings from this field mainly generated into journal for others to take advantages and improve as upcoming research on projects.

The methodology refers to the overall approach that our project requires. We need to explain our project briefly, demonstrating that we comprehend the meaning of our approaches. The methods are the tools of data collection, the

procedure of our project. The procedures or strategies used to find, select, process, and analyse information about a topic are referred to as methodology.

In this project, we implemented a Fingerprint-Based Security System Using Arduino & Fingerprint Sensor. As thefts are increasing day by day security is becoming a major concern

nowadays. So a digital fingerprint lock can secure our home or locker easily. It will open your door only when the right fingerprint is entered. Only authorized people are allowed access to the restricted sections due to a fingerprint-based door lock mechanism. The Arduino is responsible for the entire project's operation. A particular procedure or set of procedures demonstrating the issue is massive revision of teaching methodology. In a report or article, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. So, this methodology chapter explains what we did and how we did it.
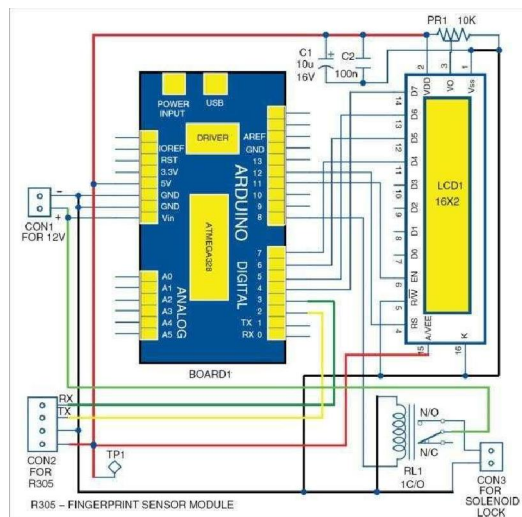
Circuit Diagram of Project

Arduino Mega Board Model:

Arduino is an open-source computer hardware, open-source software and microcontroller-based device building kit and interactive objects that can sense and control physical devices. Arduino designs and manufactures software, software and software. The project is focused on the design of the microcontrollers. The board contains a combination of digital and analog input / output (I / O) pins, which can connect to specific expansion boards (termed shields).

Fingerprint

Nothing is completely secure. Locks can be picked, safes can be broken into, and online passwords can be guessed sooner or later. How, then, can we protect the things that we value? One way is to use biometrics—fingerprints, iris scans, retinal scans, face scans, and other personal information that is more difficult to forge. Not so long ago, if you'd had your fingerprints taken, chances are you were being accused of a crime; now, it's innocent people who are turning to fingerprints to protect themselves. And you can find fingerprint scanners on everything from high-security buildings to ATM machines and even laptop computers. Let's take a closer look at how they work.

Solenoid Electric Door Lock

12V Solenoid lock are basically electromagnets: they are made of a big coil of copper wire with an armature (a slug of metal) in the middle. When the coil is energized, the slug is pulled into the center of the coil. This makes the solenoid able to pull from one end.

This solenoid lock in particular is nice and strong, and has a slug with a slanted cut and a good mounting bracket. It's basically an electronic lock, designed for a basic cabinet or safe or door.

Normally the lock is active so you can't open the door because the solenoid slug is in the way. It does not use any power in this state. When 9-12VDC is applied, the slug pulls in so it doesn't stickout anymore and the door can be opened.

The solenoid lock come with the slanted slug as shown above, but you can open it with the two Phillips-head screws and turn it around so its rotated 90, 180 or 270 degrees so that it matches the door you want to use it with.

16x2 LCD Display

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations etc.

Transistor IRFZ44N

The IRFZ44N is a N-channel MOSFET with a high drain current of 49A and low Rd value of $17.5\ m\Omega$. It also has a low threshold voltage of 4V at which the MOSFET will start conducting.

Hence it is commonly used with microcontrollers to drive with 5V. However, a driver circuit is needed if the MOSFET has to be switched in completely.

Transistor TIP122

The TIP122 is a Darlington pair NPN transistor. It functions like a normal NPN transistor, but since it has a Darlington pair inside it has a good collector current rating of about 5A and again of about 1000. It can also withstand about 100V across its collector- Emitter hence can be used to drive heavy loads.

Speaker

Speakers - Sturdy steel construction with easy-to-solder lugs and 3.3 mm mounting holes.

These speakers are often used in commercial flat screen monitors.

PAM8403 - This top of the line class D amplifier mounted on a breakout board pairs perfectly with the speakers to provide great sound.

Speaker specs:

- 4 ohm, 3 watt power
- Wires already attached
- 31 mm wide, 70 mm high, 18 mm deep.
- 4 mounting holes, 3 mm diameter.

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V. ADVANTAGES

- This project provides security.
- Power consumption is less.
- Used commonly available component.
- Circuit diagram is simple and easy.
- Easy to use and setup.

- Storage of up to 200 fingerprints.
- Generally it is used in ATM, fingerprint car and home door lock etc for security.

VI. APPLICATIONS

- Very high accuracy.
- Is the most economical biometric PC user authentication technique.
- Easy to use.
- Small storage space required for the biometric template, reducing the size of the database memory required
- It is standardized.

VII. CONCLUSION

The design and implementation of fingerprint-based door lock system is customizable and flexible. This door locking mechanism is comparatively cost-effective than the available lock systems in the traditional market. Our fingerprint-based lock system has high accuracy rate and is also quick to recognize fingerprints which enable seamless integration with the users and provides tighter security. In our country, private and government organizations are very much concerned about security. Many companies are interested in using this type of locking mechanism but the system which is available have very high installation cost. Due to this excessive cost, many small firms cannot afford such systems. Keeping the installation cost in mind we planned to develop a system

that should be affordable to both large and small firms. This design can be improved by more

intensive development and additional features such as more locks can be added to the system. Thus, we do not need to spend so much for just one lock if this can be used to control several doorways. A system to save prints without the use of a computer could have been made, but it will require more parts than the ones we used. In order to maintain security properly, the whole mechanism should be placed inside the door panel or on the other side of the door. A system for batteries couldalso be made or even solar powered. One of the main advantages of this system is its flexibility. Several other systems can be implemented with this system. The system is very secure.

Fingerprints are unique and the sensor is able to identify all of the prints during testing. It provides greater control for access to restricted places. There are some drawbacks of this system such as this system is complicated and difficult to make any change in the hardware as it is a closed system. Also it needs high power to operate so providing continuous power through batteries is a challenge sometimes. A power failure will make it unworkable. In that case, we can, connect the system withan IPS or add rechargeable batteries to the system.

Result:

The Fingerprint door lock using Arduino, we are showing the components and connected them to the power supply. This system is based for improving the security which will register the owner's fingerprint into the Arduino using the fingerprint sensor, and this system we have given 5v powersupply to Arduino through the code uploading wire. When you put your thumb on fingerprintsensor after registering yourself the lock will be unlocked and you repeat this process again thenthe solenoid lock will be got locked. The process of locking and unlocking requires less than 1second so this is why the Solenoid lock is used inside this project
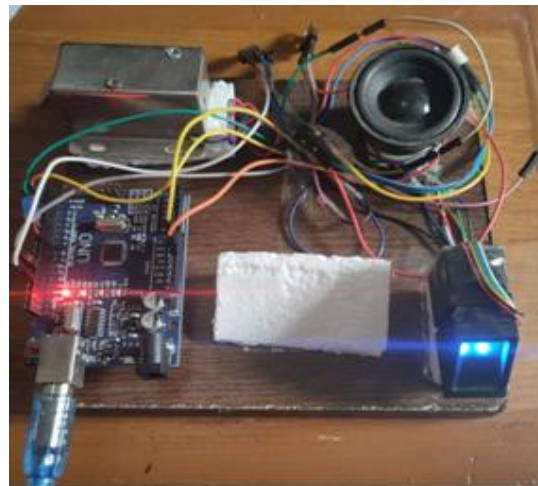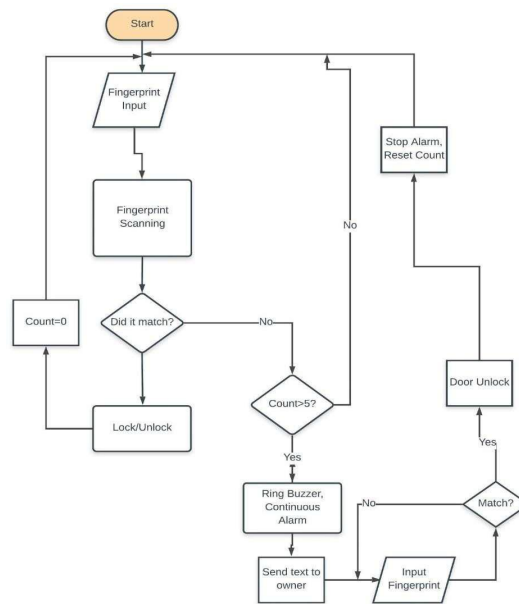
Flow-chart of system:

Fig. Proposed System

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