

**FINGERPRINT SECURITY**

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## ABSTRACT

The name of our final year project is Fingerprint Security. We usually come across a cases where a user need to find for their keys to unlock a door. Here we propose a system that allow user to use their fingerprint and a password to unlock a door. The system will verify the password entered to trigger the fingerprint sensor. The fingerprint of the user will be scanned and then are sent to the microcontroller. The microcontroller reads the input and identify the fingerprint. If the system did not recognize the fingerprint, it will ask the user to try again. Authorized fingerprints will trigger the system to unlock the door. The system also display the name of the user in Liquid Crystal Display to welcome them.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 INTRODUCTION**

This chapter is discussed about the background of the project, the problem of the project, the objective of the project, project scope and the significant of the project.

#### **1.1 BACKGROUND OF STUDY**

Imagine using a unique fingerprint to effortlessly identify and verify that you are who you claim to be. That is the power of Biometrics Technology today. If you and your family don't want to ever worry again about keys, a fingerprint door lock is a key solution to your problem.

Fingerprint lock have gained tremendous benefits compared to conventional door lock, combination door locks, keyless keypad lock or card reader locks. Thus, fingerprint door locks surpass security protection, convenience, and speed.

The old practice of using a simple key to unlock a door is time consuming as well as less secure. Replacing those methods with fingerprints and a password, we get access into a

house or room just by placing the correct fingerprint and enter the correct password. Only authorized people can open the door because of the special fingerprint technique. If the fingerprint matches with any one of the image from the database, the door unlocks and the LCD displays a welcome message along with that person's name.

## **1.2 PROBLEM STATEMENT**

How often do we see someone forgot or, worst case scenario, lost his office keys, while everyone is waiting for him to unlock the door? Not to mention the fact that it will cost an exorbitant amount to have a professional locksmith unlock the door and have the door lock replaced. Fingerprint door locks are the solution. The main problem that this project attempts to avoid is any crimes especially stealing and burglar activities. House or room that using normal keys are exposed to the risk of being targeted by intruders. There must be an efficient and reliable system to help the user to lock the door. Even if they forget to lock the door, the system will automatically lock the door using a magnetic lock. Most doors designed with a normal key lock suffer from some possible flaws. Firstly, the key has a potential of being duplicated. Next, there are possibilities of losing keys.

### 1.3 OBJECTIVES OF RESEARCH

The objectives of the project are:

- ❖ Investigate the usefulness of fingerprint security
- ❖ Investigate the features of fingerprint security and its security measures
- ❖ Fabricate the Arduino and magnetic door lock needed for the project

### 1.4 SCOPE OF STUDY

To achieve project objectives, we develop a model for our project that mainly includes a fingerprint scanner, keypad, LCD, and magnetic door lock. The design and implementation of security door using fingerprint is based on discrete components magnetic lock, Arduino, LCD, LED etc. this project design can be mounted on room doors, house main doors, office doors, hotel doors, etc with the incorporation of magnetic lock that will be able to open up doors when activated by authorized fingerprints. The project starts from information research and research for reference whether printed or electronic. As well as information and advice from the supervisor is also very useful for the project to run smoothly. Then the project was sketched based on the information obtained. The circuit to be tested with simulations then tested manually on board. After proven it is capable of functioning and then it is being mounted on PCB. However, the number of fingerprints are limited based on the model of the fingerprint scanner. Lastly, each fingerprint must have unique ID number assigned since this is the prime factor to be utilized during the identification of the valid user.

## 1.5 SIGNIFICANT OF PROJECT

- i. Greatly reduces robbery cases
  - ❖ Normal keys has many flaws
- ii. Auto-lock function
  - ❖ The user did not have to lock the door back as the system will automatically lock the door after several seconds. This is good to prevent intruder entering the house/office
- iii. A buzzer to alert the door being opened
  - ❖ The buzzer will notify people in the house/room if it is being opened.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 INTRODUCTION

This chapter will provide information literally about this final year project. Mainly, the topics that are discussed in this chapter are the project description, device used, and the function of components.

#### 2.1 PROJECT DESCRIPTION

Recently, there has been recorded tremendous increase in the crime rate everywhere in the world. This issue is turning more severe every day. To get away with this problem, we decided to use technology and there this project “Fingerprint Security” developed. We know the saying very well – *‘Prevention is better than cure’*, rather than to face the loss it is much better to take necessary actions to eradicate that issue before it happens. The project helps us to implement the fact. The reason behind the fact that project has gained so much popularity in a short interval is mostly because of its simplicity and attractive features. Today,

fingerprint project is linked with security and major task, later it may be employed as fingerprint based driving license, bank accounts operation and so on. 'Matching Algorithm is the main principle of this project where specified templates of fingerprints are initially stored. Then, the fingerprint of the user is compared with the pre-stored templates of fingerprints. It verifies authentication process.

## 2.2 DEVICE USED

### 1) ARDUINO UNO Board (ATMEGA328P-PU)



Figure 2.1 Arduino uno

Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP). The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

**Features:**

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz



## 2) Fingerprint scanner



Figure 2.2 Fingerprint Scanner

The Rx and Tx pin of fingerprint sensor is connected across D0 and D1 pin of the Arduino board respectively as shown in figure above. Since this module is constructed using UART technology, it is easy to interface sensor directly with the MCU or also to the PC using USB serial adaptor. The information collected from the fingerprint can be collected in the module. During the process of identification, the data can be configured in either 1:1 or 1:N module. In order to ensure serial communication, two pins of the sensor, Tx and Rx are connected across digital pin 0 and 1 of Arduino Uno.

### 3) Liquid Crystal Display (LCD) 16x2

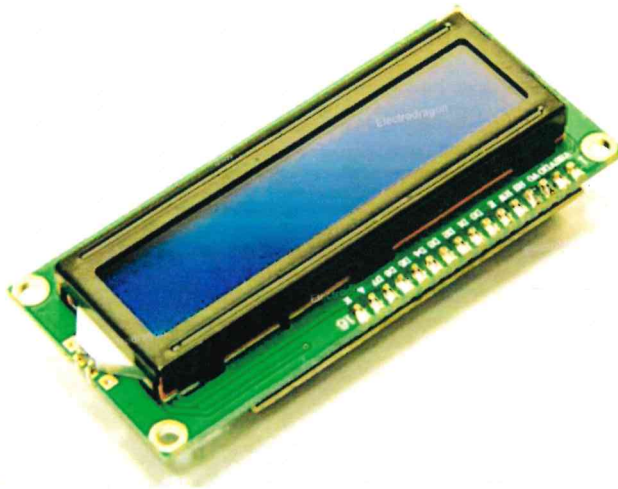


Figure 2.3 Liquid Crystal Display (LCD)

LCD is used to display message to the user when any key is pressed. LCD has a separate header file which includes functions and commands to write us on LCD. Therefore, when we are using LCD module, we have to import its header file LCD.h to our main code.

#### 4) Magnetic door lock

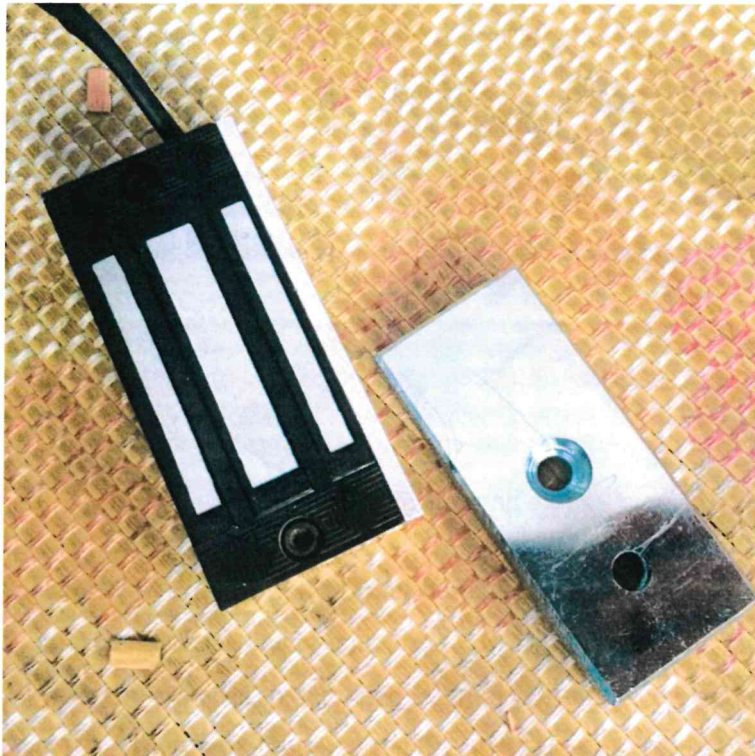


Figure 2.4: Magnetic Door Lock

An electromagnetic lock, magnetic lock, or maglock is a locking device that consists of an electromagnet and an armature plate. There are two main types of electric locking devices. Locking devices can be either "fail safe" or "fail secure". A fail-secure locking device remains locked when power is lost. Fail-safe locking devices are unlocked when de-energized. Direct pull electromagnetic locks are inherently fail-safe. Typically the electromagnet portion of the lock is attached to the door frame and a mating armature plate is attached to the door. The two components are in contact when the door is closed. When the electromagnet is energized, a current passing through the electromagnet creates a magnetic flux that causes the armature plate to attract to the electromagnet, creating a locking action. Because the mating area of the electromagnet and armature is relatively large, the force created by the magnetic flux is strong enough to keep the door locked even under stress.

## 1) 4x4 Number Keypad



Figure 2.5: Keypad 4x4

Here it is used 4×4 matrix keypad to enter passwords for accessing Door lock. In here it has been interfaced keypad as below to the Port D register of the microcontroller. R1, R2, R3 resistors are used to activate internal pull-ups. Keypad is like a 4×4 matrix which has rows and columns. Each key acts as an opened switch, when it is pressed any key path will be completed and current is going through. Pins of Port D then read that changing signal and read assigned value to that key and output it.

### Identifying the keypad pins

First you need to get a piece of paper and draw the right-hand diagram as you see it below. I've already written my pin numbers (1, 2, and 3 across the bottom and 7, 6, 5, 4 down the right side) which you can just leave off of your drawing. Next, you are going to use your Ohm meter to find out which pins are connected to which keys. The first thing to do is count how many pins are on your keypad (as seen in the photo below.) The photo is showing 14 pins though not all of the pins are used. Don't worry, once you've completed this procedure you will know which pins are unused and can be ignored.