

## CHAPTER 1

### INTRODUCTION:

The issue of car hijacking or snatching on highway, car theft due to easy access to car's functional system can be reduced by using a biometric system for starting the car's engine as the necessity of protection and access restriction in many luxurious assets is now very important. Biometric systems have in a long time served as a strong security system in many different applications and it can also be implemented in automobile industry.

Biometric system is a technological system that uses information about a person to identify such the person. It relies on specific data about unique biological trait in order to work effectively. This system involves running data through algorithms for a particular result, usually related to a positive identification of a user or other individuals. Fingerprint as one of the biometric techniques is an impression of ridges of one's fingertip. This technique is said to be the oldest of all biometric techniques as it is recorded to be used by the Assyrian, the Babylonians, the Chinese and Japan in 2200BC. So, the use of fingerprint as a personal code has a long tradition.

Fingerprint recognition system is inexpensive compared to other biometric systems, is user friendly, has high reliability and can be used in a variety of environments. Problem Identification

A security system, such as a fingerprint system, can help to reduce theft, particularly in automobiles. Fingerprint sensor and Arduino are combined. The vehicle's starting system has been modified. The basic connection is from the ignition switch to the voltage regulator, then to the Arduino to turn it on and off, and when input is given to the fingerprint sensor, it scans the finger. Matching fingerprints will activate the relay that controls the starter relay. This will start the engine. The fingerprint sensor will then turn off. If no finger was scanned or the image did not match, it will display finger not found. Please try again. The fingerprint sensor will not start the vehicle engine.

## 1.1 PROBLEM IDENTIFICATION:

Identifying the problem for the Biometric vehicle starting system project, where the idea is to integrate a system into bikes that prevents them from starting unless the authorized users can their fingerprint, involves understanding the following key points:

**Security Concerns:** The primary problem being addressed is the issue of vehicles are theft due to poor security of vehicle due to this he ratio of vehicle theft is also increases.

**Comfort:** Biometric access is a protected and less time-consuming process. User can access their car only using their fingerprint impression.

In today's life multiple vehicles are stolen to protect vehicle this system is very useful.

## 1.2 RESEARCH GAP:

The use of biometrics as a tool for identification and security purposes began in the late 19th century with the work of Alphonse Bertillon.

In 1879, the French police officer developed a system of anthropometry, which involved measuring various physical features, such as height, weight, and the size of the head, arms, and feet, to identify criminals.

This system was widely used by police departments around the world and was considered the gold standard for identification until the early 20th century.

In the early 20th century, the first fingerprinting systems were developed, and their use became widespread. Fingerprint identification is now widely used by Police and Law Enforcement organizations.

Biometric systems, such as voice, iris and facial recognition were developed in the latter half of the 20th century. These technologies became commercially viable in the 2010s and widely used since then.

Hyundai has claimed that this unit is first of its kind as it incorporates both technologies of unlocking and starting the car engine in a single system.

The company confirmed that this system will be first installed in the 2019 Santa Fe SUV which will be launched worldwide in the first quarter of the next year.

## 1.3 MOTIVATION:

This starts the ignition of vehicle when authorized users can their fingerprint. It improves the security of Vehicle.

In today's life vehicle is becoming most important thing in human's life. The ratio of vehicle theft is continuously increases. There are many vehicles are theft because of poor security of vehicle. There is need to protect the vehicle from being theft. This is very best system to protect the vehicle from being theft and it increases the security of vehicle.

## **1.4 OBJECTIVES OF STUDY:**

The main objective of this project are -

- To design Fingerprint Based vehicle starting system.
- To develop the system which uses the Arduino Uno.
- This design makes it easy and secure to start or stop the engine of vehicle.
- To make one time investment with minimum running expense.

## **1.5 SCOPE OF STUDY:**

There are many other achievements carried out by researchers, nevertheless, further improvements should be made to the automatic vehicle starting systems in order to protect the vehicle from theft.

This design takes over the task of protecting the vehicle from theft and improves the security of vehicle. This is very wonderful design to control the working of Biometric vehicle starting system.

## CHAPTER 2

### LITERATURE SURVEY:

The history of fingerprint started in China. That was when the first record of the Teck neck was being used with thumb prints being imprinted in clay. In the 14th century, various Persian government papers had impression of fingers. Observation had it that no two fingerprints were exactly alike. In 1880, Henry Faulds proposed an article where friction ridges can be extensively used in crime scenes to identify criminals. He gave two examples which are; a sooty finger marks on a white wall exonerated an accused individual and a greasy print on a drinking glass that revealed who had been drinking some distilled spirits (Faulds, 1923) Fingerprint matching techniques are of two types: graph based and minutiae based. The template size of the biometric information based on minutiae is much smaller and the processing speed is higher than that of graph-based fingerprint matching. These characteristics are very important for saving memory and energy on the embedded devices (K and J., 1990). So much work as been done using the fingerprint for one kind of security system or the other, among whom are the works of Kumar, Mudholkar, Pandit, Kawale, to mention but a few (Kumar and Ryu, 2009, Kumar and Kumar, 2014, Mudholkar et al., 2012, Pandit et al., 2013 , Kawale, 2013).

Modern vehicles uses computer controlled battery ignition system; no matter the type of mechanism used, all ignition systems use battery, switch, coil, switching device and spark plug Delmar (2008). However, in this modern technology dispensation, biometrics has been employed for the ignition and security process (Omidiora et al., 2011, Sasi and Nair, 2013, Karthikeyan.a and Sowndharya.j, 2012, Pingat et al., 2013).

## CHAPTER 3

### BLOCK DIAGRAM:

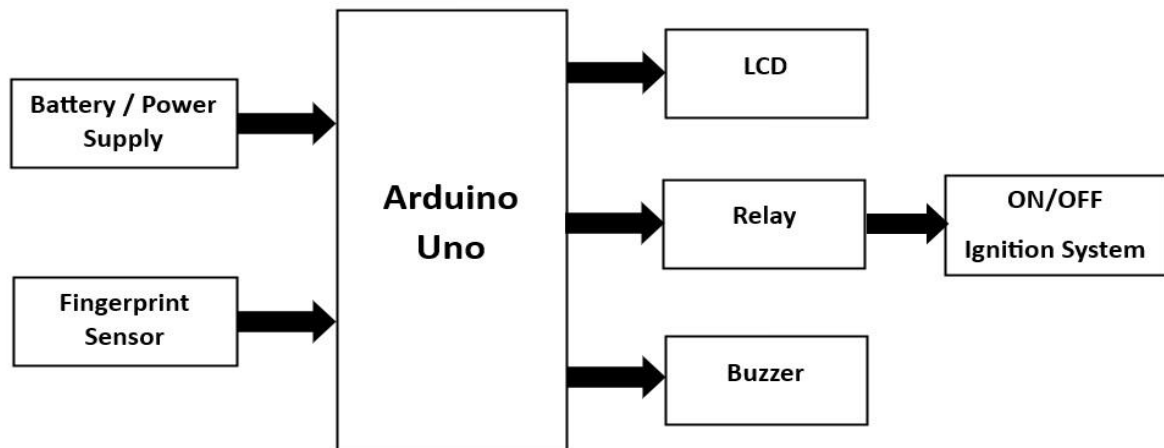


Figure 3.1: Block diagram

### 3.1 DESCRIPTION OF BLOCK DIAGRAM:

The block diagram of biometric vehicle starting system contain the components like Fingerprint sensor, Arduino uno, LCD, Relay and Buzzer.

#### Use of each component:

##### 1)Fingerprint Sensor:

Fingerprint sensor module captures finger's print image and then converts it into the equivalent template and saves them into its memory as per selected ID by Arduino. All the process is commanded by Arduino like taking an image finger's print, convert it into templates and storing as ID etc.

##### 2)Arduino Uno:

Arduino UNO is a microcontroller board based on the ATmega328P. In this project we have used Arduino for processing the input signal provided by the Fingerprint sensor and the output by opening the door.

##### 3)Relay:

In this project relay are used to turn on or turn off the ignition of a vehicle.

##### 4)LCD:

An LCD is an electronic display module that uses liquid crystal to produce a visible image.

The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates to display 16 characters per line in 2 such lines.

### 5) Buzzer:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, trains, and confirmation of user input such as a mouse click or keystroke. In this project, the buzzer goes off if the fingerprint does not match.

### Circuit Diagram:

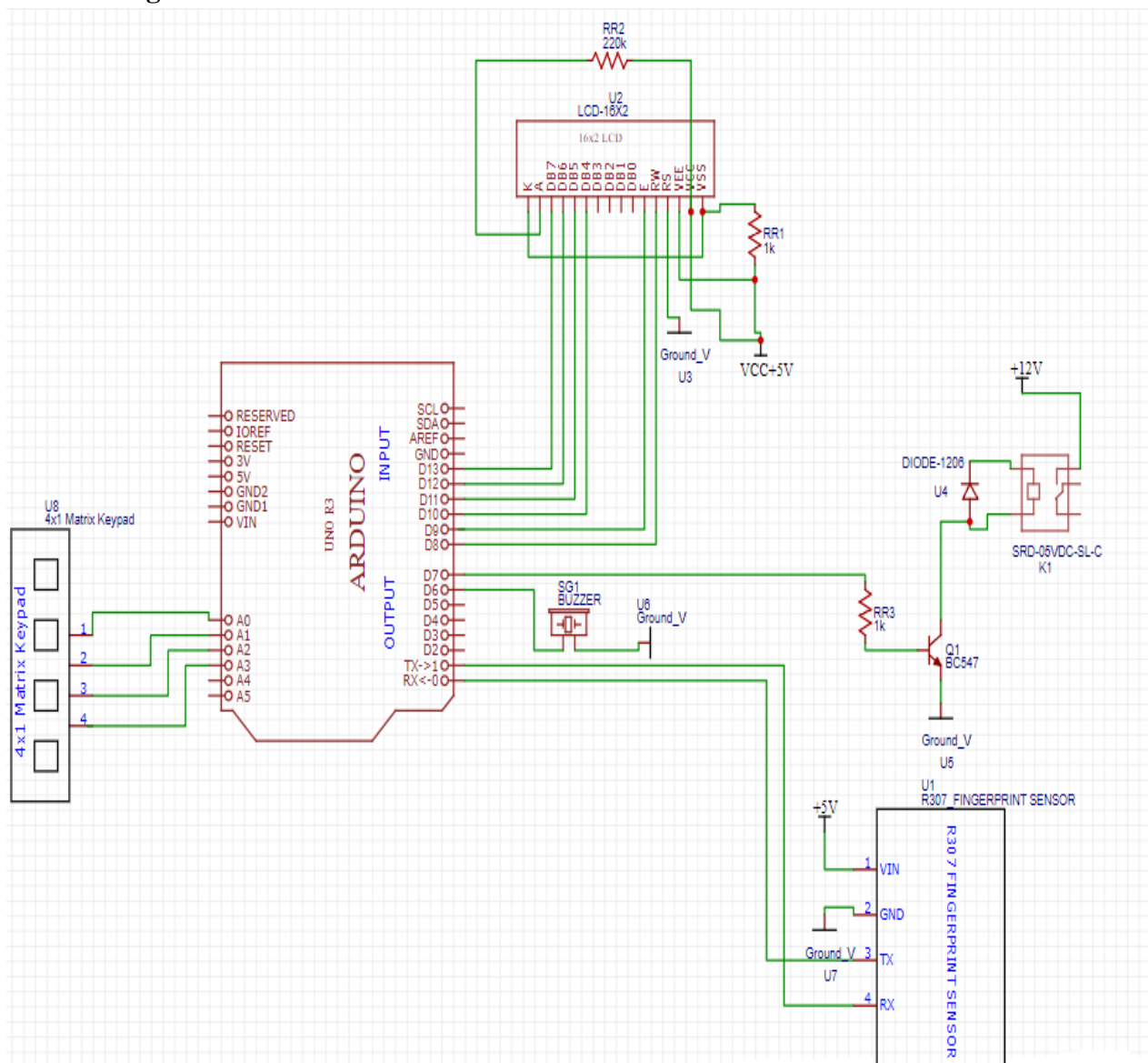


Fig 3.2: Circuit Diagram

## CHAPTER 4

### SYSTEM DEVELOPMENT:

#### 4.1 ARDUINO UNO:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message and turn it into an output - activating a motor, turning on an LED, publishing something online.

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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. You can tinker with your Uno without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

The technical specifications of the Arduino UNO are listed below:

- There are 20 Input/Output pins present on the Arduino UNO board. These 20 pins include 6 PWM pins, 6 analog pins, and 8 digital I/O pins.
- The PWM pins are Pulse Width Modulation capable pins.
- The crystal oscillator present in Arduino UNO comes with a frequency of 16MHz.
- It also has a Arduino integrated WIFI module. Such Arduino UNO board is based on the Integrated WIFI ESP8266 Module and ATmega328P microcontroller.
- The input voltage of the UNO board varies from 7V to 20V.
- Arduino UNO automatically draws power from the external power supply. It can also draw power from the USB.

## BIOMETRIC VEHICLE STARTING SYSTEM USING ARDUINO

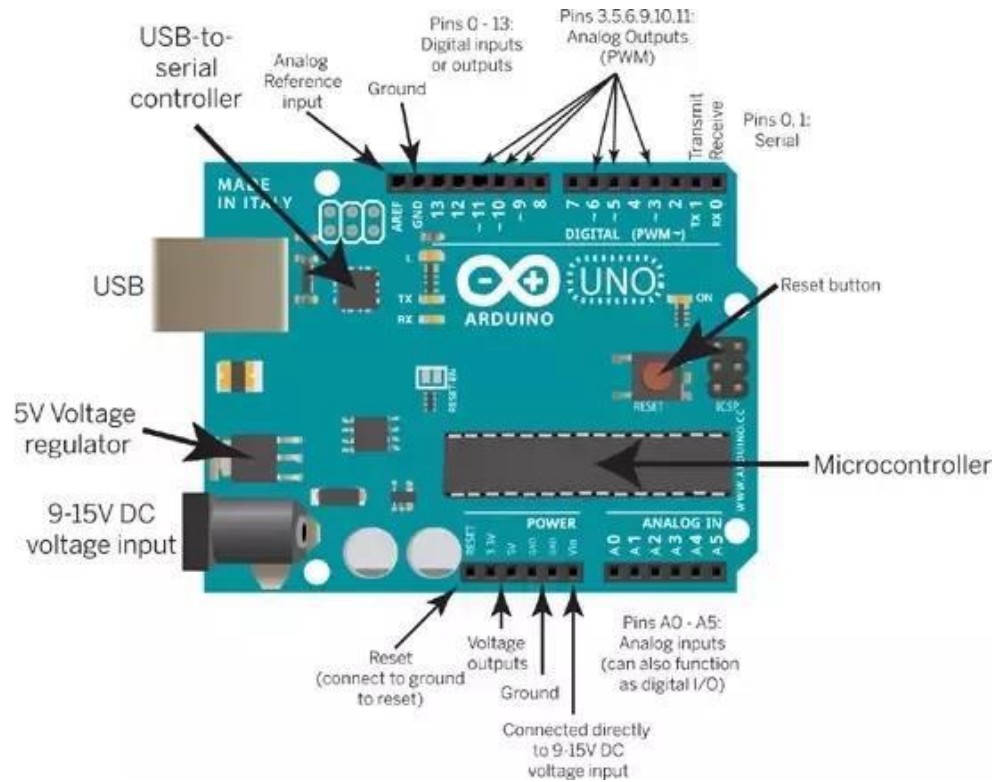


Figure 4.1: Arduino Uno.



## 4.2 FINGERPRINT SENSOR:

The definition of a biometric sensor is an identification & authentication device that uses automated methods of recognizing or verifying the characteristics, of a living person depending upon physical attributes like facial images, fingerprints, voice recognition & Iris. So, these sensors collect measurable biometric signals from a human being then they can be used in combination with the algorithms of biometric recognition to perform the identification of an automated person.

R307, or the new R305 is a finger print sensor module with TTL UART interface for direct connections to microcontroller UART, or to PC through MAX232 / USB-Serial adapter. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The fingerprint module can directly have the interference with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interference with PC serial port. Optical biometric fingerprint reader with great features can be embedded into a variety of end products, such as: access control, attendance records, safety deposit box, car door locks etc.

Its features include:

- Integrated image collecting and algorithm chip together, All-in-one.
- Fingerprint reader can conduct secondary development, can be embedded into a variety of end products.
- Low power consumption, low cost, small size, excellent performance.
- Professional optical technology, precise module manufacturing techniques.
- Good image processing capabilities, can successfully capture image up to resolution 500 dpi.

Specifications of R307/305:

- Fingerprint sensor type: Optical.
- Sensor Life: 100 million times.
- Static indicators: 15KVBacklight: bright green.
- Interface: USB1.1/UART (TTL logical level).
- RS232 communication baud rate: 4800BPS~115200BPS changeable.
- Dimension: 55\*32\*21.5mm.
- Image Capture Surface 15—18(mm).
- Verification Speed: 0.3 sec.
- Scanning Speed: 0.5 sec.
- Character file size: 256 bytes.
- Template size: 512 bytes.
- Storage capacity: 250.
- Security level: 5 (1,2,3,4,5(highest)).
- False Acceptance Rate (FAR) :0.0001%
- False Rejection Rate (FRR): 0.1%
- Resolution 500 DPI.

## BIOMETRIC VEHICLE STARTING SYSTEM USING ARDUINO

- Voltage :3.6-6.0 VDC.
- Working current: Typical 90 mA, Peak 150mA.
- Matching Method: 1: N.
- Operating Environment Temperature: -20 to 45° centigrade.



Figure 4.2: Fingerprint Sensor

### 4.3 RELAY:

Relay is electro-mechanical device which is used to isolate one electrical circuit from another. It allows a low current control circuit to make or break an electrically isolated high current circuit path. Total isolation is provided by the relay between the triggering source applied to the terminal and the output. This total isolation is a feature that makes relay different from other integrated circuits and is also important in many digital applications. It is a feature that certain semiconductor switches (e.g. transistors, diodes and integrated circuits) cannot provide. In this circuit a 12V magnetic relay is used. In magnetic relay, insulated copper wire coil is used to magnetize and attract the plunger. The plunger is normally connected to N/C terminal. A spring is connected to attract the plunger upper side. When output is received by relay, the plunger is attracted and the buzzer is on.

**APPLICATIONS OF RELAY:** Typical applications for relays include laboratory instruments, Telecommunication system, computer interfaces, domestic appliances, air conditioning and heating, automotive electrics, traffic controller, lighting control, building control, turboelectric power control, business machines, controls of motor and solenoids, tooling machine, production and test equipment's.

**THE PRIMARY FUNCTIONS OF RELAY ARE:** The galvanic separation of primary or actuating circuit and the load circuits. Single inputs multiple output capability. separation of different load circuits for multi-pole relays. separation of AC and DC circuits. interface between electronic and power circuits. multiple switching functions, e.g. delay, signal conditioning amplifier function. Relay is electro-mechanical device which is used to isolate one electrical circuit from another. It allows a low current control circuit to make or break an electrically isolated high current circuit path. Total isolation is provided by the relay between the triggering source applied to the terminal and the output. This total isolation is a feature that makes relay different from other integrated circuits and is also important in many digital applications. It is a feature that certain semiconductor switches (e.g. transistors, diodes and integrated circuits) cannot provide. In this circuit a 12V magnetic relay is used. In magnetic relay, insulated copper wire coil is used to magnetize and attract the plunger.

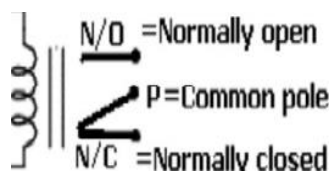


Figure 4.3: Relay

#### 4.4 KEYPAD:

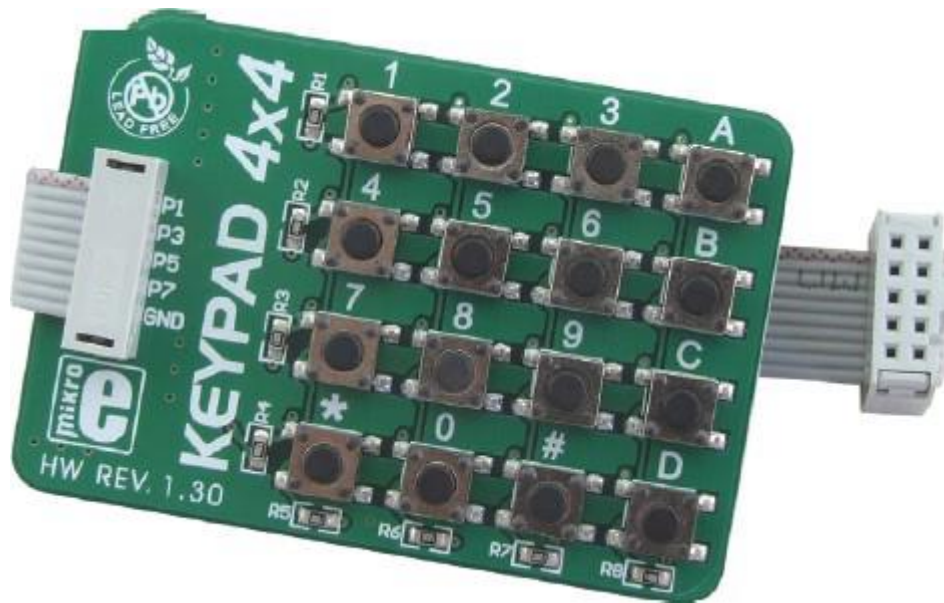


Figure 4.4: Keypad

Keypad is a set of buttons that are arranged in a block or “pad” which usually bear digits, symbols and a complete set of alphabetical letters. If it mostly contains numbers then it is called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, push-buttons, telephones, combination locks, and digital door locks which require mainly numeric input. It consists of 5 buttons arranged in a form of an array containing 1 line and 5 columns.

The Working of keypad described as: The first button of keypad is used to add new fingerprint in the Arduino uno. The second button are used to start the vehicle when you pressed the second button then you will start the vehicle by placing your finger of fingerprint sensor.

The third button is for up command and the fourth button is for down command. And the fourth button is also used for deleting the fingerprint from database.

#### 4.5 LCD (Liquid Crystal Display):

This is the first interfacing example for the Parallel Port. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if not, all Parallel Ports. It however doesn't show the use of the Status Port as an input. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required to run them is on board. The LCD panel's Enable and Register Select is connected to the Control Port. The Control Port is an open collector / open drain output. While most Parallel Ports have internal pull-up resistors, there are a few which don't. So, we can add external pull resistors which makes the circuit more portable. Therefore, by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors. We hard wire the R/W line of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result, we cannot read back the LCD's internal Busy Flag which tells us if the LCD has accepted and finished processing the last instruction. This problem is overcome by inserting known delays into the program. The 10k Potentiometer controls the contrast of the LCD panel. The power supply can be set to 5v or on onboard +5 regulator. The 2-line x 16-character LCD modules are available from a wide range of manufacturers. It is used to display the day, real time and alarm timings. The time is displayed in the HH:MM format.

**LCD BASICS:** LCDs use voltage-sensitive organic molecules with a helical structure that either block or permit the passage of polarized light. Areas filled with molecules that form parts of the display are called segments or pixels. For proper function, alternating current (AC) has to be applied to the segments. LCDs with only a few segments can be operated in static mode, i.e. each segment has its own wire or pin that is connected to an AC voltage source (driver). In order to keep the number of connections low, LCDs with medium or large density are usually operated in multiplexed mode, i.e. individual segments share pins with others, and the display is driven by selecting one group of segments for a brief period of time and then moving on to the next group. The inertia of the organic molecules in a segment keeps the segment ON while the driver is accessing another group of segments. Depending on their operation mode, LCDs are usually categorized as: Static Drive: LCD Glass or LCD Modules with a simple segment display are the only parts that have an option of Static Drive. The Static Drive configuration means that there is an individual control line to select each LCD segment and there is only a single common line that connects to them all. This configuration produces the best display with the widest temperature range, but it requires more interconnections that a multiplexed display would require. Multiplexed Drive: The Multiplexed Drive configuration means that each control line selects several LCD segments and that the final selection is made by selecting the correct common signal that also connects to several LCD segments. This configuration uses fewer interconnections which is cost effective for smaller displays. This configuration degrades the temperature and image performance slightly.



Figure 4.5: LCD

#### 4.6 JUMPER WIRES:

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit. storage devices and has been adapted to many different classes of devices, including 802.11 cards, Bluetooth devices, and modems.



Figure 4.6: Jumper Wire

#### 4.7 POWER SUPPLY:

A power supply is an electrical device that offers electric power to an electrical load such as laptop computer, server, or other electronic devices. The main function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

## **CHAPTER 5**

### **SOFTWARE DEVELOPMENT:**

#### **5.1 C++ LANGUAGE:**

C++ is a general-purpose object-oriented programming language. C++ is known for its performance, efficiency, and low-level memory manipulation capabilities. It's widely used in various applications, as it was developed to write the operating system.

The main features of C++ language include:

- General purpose and portable
- Low level memory access
- Fast speed
- Clean syntax.

#### **Adafruit fingerprint Library:**

This library provides a simple device independent interface for interacting with Adafruit IO using Arduino.

This library let you use an Adafruit Fingerprint sensor on any UART to get, store, retrieve and query fingerprint great for adding bio sensing security to your next build.

Connects to any microcontroller or system with TTL serial, and send packets of data to take photos, detect prints, hash and search.



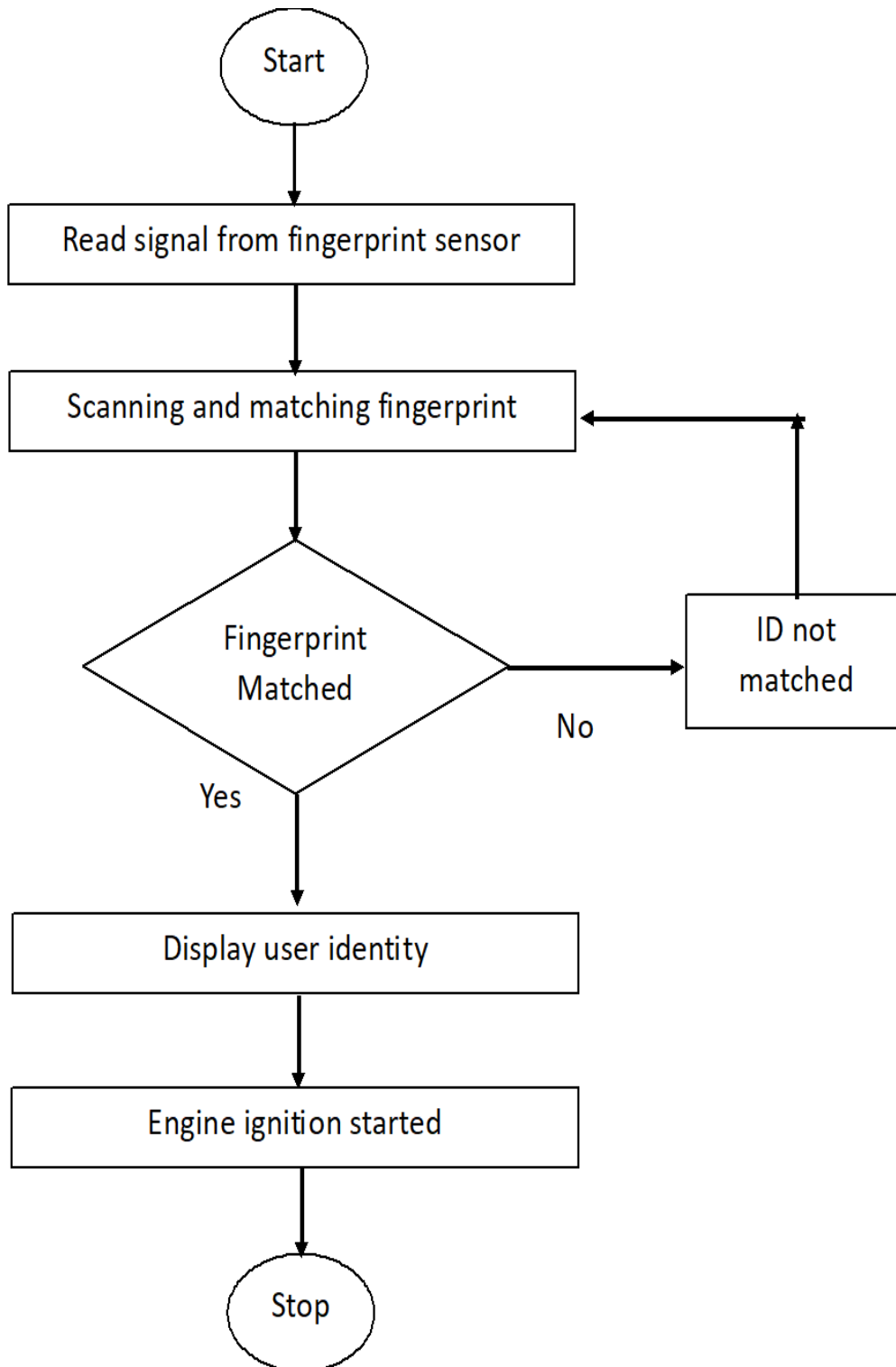
**5.2 FLOW CHART:**

Figure 5.3: flowchart

## **CHAPTER 6**

### **ADVANTAGES AND APPLICATIONS:**

#### **6.1 Advantages:**

- Enhanced security through unique biometric identification
- Reduced risk of vehicle theft and unauthorized access
- Easy to handle
- High accuracy
- Potential for additional features like remote access and engine immobilization

#### **6.2 Applications:**

- In college and schools
- In Government offices
- In Industries
- In house hold appliances
- Personal vehicles
- Fleet management for commercial vehicles
- Rental cars and carpooling services





Fig 7.324

## CHAPTER 8

### 8.1 CONCLUSION:

This work is a well operating prototype of a fingerprint-based car starting system. The system intelligent agents were able to communicate well and appropriate output is given under user input. The system requests for user's finger, process it and give appropriate output based on if the finger is stored in the fingerprint module or not. The system is also able to enroll new user's finger at request but prompt for passcode before it could be done. Passcode editing can also be done on request in the system. Hence, fingerprint technology improves the security of an automobile making it possible for the car to be used by only authorized users. Therefore, implementing this system on vehicles makes the achievement of our car security system comes in a cheap and easily available form. The output is viewed with the use of an LED. Biometric recognition systems present security and convenience than conventional methods of personal recognition.

## CHAPTER 9

### 9.1 REFERENCES:

- Omidiora E. O. Fakolujo O. A. Arulogun O. T. and Aborisade D. O, “A Prototype of a Fingerprint Based Ignition Systems in Vehicles”, European Journal of Scientific Research, Vol.62, No.2, pp. 164- 171,2011.
- Karthikeyan.A & Sowndharya.J, “Fingerprint Based Ignition System”, International Journal Of zFW#Computational Engineering Research, Vol. 2, Issue No.2, pp. 236-243. 2012.
- ADEOYE, O. S. 2010. A survey of emerging biometric technologies. International Journal of Computer Applications, 10.
- FAULDS, H. 1923. A Manual of Practical Dactylography, " Police review" Publishing Company, Limited.
- GRAEVENITZ, G. 2003. Introduction to fingerprint technology. A&S International, 53, 84-86.
- K, H. A. & J., M. 1990. Automated fingerprint recognition using structural matching, Pattern Recognition. vol. 23, no. 8, 893 - 904.
- KARTHIKEYAN.A & SOWNDHARYA.J 2012. Fingerprint Based Ignition System.
- Karthikeyan A, Sowndharya.J International Journal Of Computational Engineering Research Vol. 2 | Issue No.2 |236-243.
- KAWALE, A. 2013. Fingerprint based locking system. International Journal of Scientific & Engineering Research, 4.
- KUMAR, D. & RYU, Y. 2009. A Brief Introduction of Biometrics and Fingerprint Payment Technology. International Journal of Advanced Science and Technology, Vol. 4, March.
- KUMAR, M. V. & KUMAR, S. R. 2014. Fingerprint Based Licensing System for Driving.
- MUDHOLKAR, S. S., SHENDE, P. M. & SARODE, M. V. 2012. Biometrics

Authentication Technique For Intrusion Detection Systems Using Fingerprint Recognition. International Journal of Computer Science, Engineering and Information Technology (IJCSEIT),, Vol.2, No.1, February.

- OMIDIORA, E., FAKOLUJO, O., ARULOGUN, O. & ABORISADE, D. 2011. A Prototype of a Fingerprint Based Ignition Systems in Vehicles. European Journal of Scientific Research, 164-171.
- PANDIT, V. R., JOSHI, K. A. & BAWANE, N. G. 2013 ATM Terminal Security using Fingerprint Recognition.
- PINGAT, S., RAKHECHA, S., AGRAWAL, R., MHETRE, S. & RAUSHAN, P. 2013. Real Time Smart Car Security System by Using Biometrics. International Journal of Innovative Technology and Exploring Engineering (IJITEE), 2.
- SASI, A. & NAIR, L. R. 2013. Vehicle Anti-theft System Based on an Embedded Platform. International Journal of Research in Engineering and Technology, 2.