# FINGERPRINT VEHICLE STARTER

A Course End Project Submitted in Partial Fulfillment of the Requirements

for the Course of

**ENGINEERING EXPLORATION**

In

**Department of Freshman Engineering**

**By**


| Roll Number | Name of the Student |
|---|---|
| 21881A04A2 | M. Bala Sai Charan |
| 21881A04A4 | M Abdul Rahman |
| 21881A04A9 | N. Kamalakar |
| 21881A04B1 | P. Surya Chaitanya |
| 21881A04B5 | Sai Prakhyath |
| 21881A04C5 | V. Sindhuja |



**VARDHAMAN COLLEGE OF ENGINEERING**

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC with A++ Grade, ISO 9001:2015 Certified

Kacharam, Shamshabad, Hyderabad – 501218, Telangana, India

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## DEPARTMENT OF FRESHMAN ENGINEERING

## CERTIFICATE

Certified that this is a bonafide record of the course end project work entitled, **"Fingerprint Vehicle Starter"**, done by, **Bala Sai Charan (21881A04A2), Abdul Rahman (21881A04A4), Kamalakar (21881A04A9), Surya Chaitanya (21881A04B1), Sai Prakhyath (21881A04B5), Sindhuja (21881A04C5**) submitted to the faculty of **Freshman Engineering**, in partial fulfillment of the requirements for the course of **ENGINEERING EXPLORATION** during the year 2021-2022 (II Semester).

**Course Instructor:**
**Dr. M Naresh Kumar**
Professor,
Dept of Electronics and Communication Engineering,
Vardhaman College of Engineering,
Hyderabad.

**Head of the Department:**
**Dr. G. Krishna Kumari**
HOD,
Dept of Freshman Engineering
Vardhaman College of Engineering
Hyderabad.

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Semester End Examination held on……**13\10\2022**……

**SIGNATURE OF THE EXAMINER(S)**

**1.**

**2.**

## Abstract

The issue of vehicle hijacking or car theft due to easy access to vehicle's functional system can be reduced by using a biometric system. The starting of vehicle'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 will 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. The signals are generated by the arduino to appropriate module circuit.

# List of Contents

# Chapter – 1

## Introduction

Fingerprint recognition technology allows access to only those whose fingerprints that are pre stored in the memory. Stored fingerprints are retained even in the event of complete power failure or battery drain. These eliminates the need for keeping track of keys or remembering a combination password, or PIN. It can only be opened when an authorized user is present, since there are no keys or combinations to be copied or stolen, or locks that can be picked. The fingerprint based lock therefore provides a wonderful solution to conventionally encountered inconveniences. This report focuses on the use of fingerprints to unlock locks, as opposed to the established method of using keys. In order to prevent unauthorized access to these devices, passwords and other pattern based authentication method are being used in recent time. However, password-based authentication has an intrinsic weakness in password leakage. Vehicle security system has been a topic of great interest over the years due to the increasing vehicle theft cases reported all over the world. Most of the advanced vehicle security systems best suit the four wheelers. As of the security system for two wheelers is concerned, the systems available in market are of no match to the well-equipped thieves. When under attack, these systems can only immobilize the engine and sound a loud alarm.

# Chapter – 2

## Literature Survey

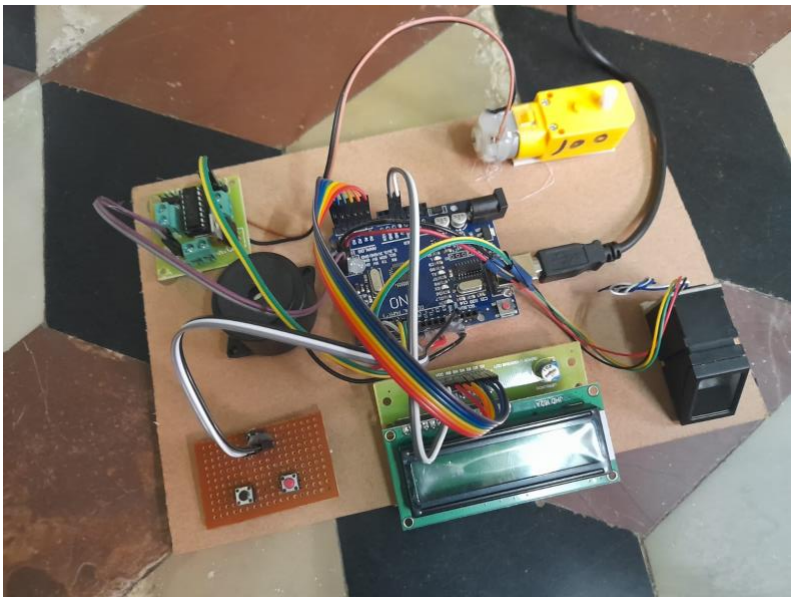
Review The history of fingerprint started in China. That was when the first record of the teckneck was being used with thumb prints being imprinted in clay. In the 14th century, various Persian government papers had impression of fingers. Observation had it that no two fingerprints were exactly alike. 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)

# Decision Matrix

| Criteria | Appearance Criteria-1 | Cost of production Criteria-2 | Ease of use Criteria-3 | Availlability Criteria-4 | Row Total | Normalized value |
|---|---|---|---|---|---|---|
| Appearance Criteria-1 | | 0 | 0 | 1 | 1 | 0.04 |
| Cost of production Criteria-2 | 4 | | 2 | 3 | 9 | 0.36 |
| Ease of use Criteria-3 | 4 | 2 | | 4 | 10 | 0.4 |
| Availlability Criteria-4 | 3 | 1 | 0 | | 4 | 0.16 |
| | | | | Column Total: | 24 | |

# Chapter – 3

The issue of vehicle hijacking or car theft due to easy access to vehicle's functional system can be reduced by using a biometric system. The starting of vehicle'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 will 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. The signals are generated by the arduino to appropriate module circuit.



## Components Used :

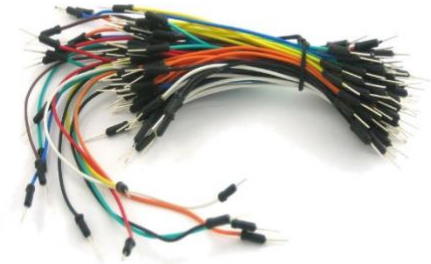
Arduino UNO

Fingerprint Sensor

Alphanumeric LCD


DC motor

Connecting Wires



Buzzer

## Algorithm of Fingerprint based Vehicle starting system :

1.Start

2. Place a finger and press enter button (top button) to start engine.

3. If finger already stored in the scanner module, start the engine.

4. If not, go back to number 1 and give no output.

5. Press ENTER button (bottom button) to enter passcode.

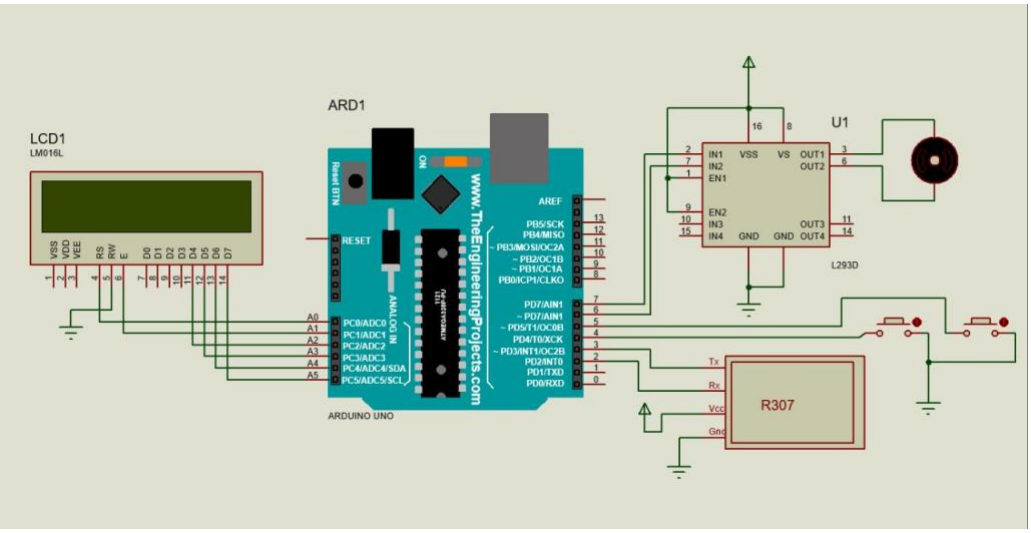
6. If passcode matches with saved code in chip's EPROM. Open user admin, activate module to receive finger image data and store it and go to number 7.

7. If passcode entered does not correlate with chip's value in the EPROM, signify wrong passcode and go back to number 4.

8. Navigate through options in user admin to edit passcode and exit interface.

9. Stop.

**Circuit Diagram :**




# Arduino Code :

```
#include <Adafruit_Fingerprint.h>
#include <SoftwareSerial.h>
#include<LiquidCrystal.h>
SoftwareSerial mySerial(2, 3);
LiquidCrystal lcd(A0,A1,A2,A3,A4,A5);
#define en_sw   4
#define ver_sw  5
#define m1  6
#define m2  7
#define buz 11
int u1=0,u2=0,u3=0;
Adafruit_Fingerprint finger = Adafruit_Fingerprint(&mySerial);
bool ch_status=false,flag_check=true;
uint8_t id = 0;
int i=0,id_val,a=0,b=0,flag1 = 0,flag2=0,flag3=0;
int getFingerprintIDez();
//////////////////////////
void setup()  {
  pinMode(en_sw, INPUT_PULLUP);
  pinMode(ver_sw,INPUT_PULLUP);
  pinMode(m1,OUTPUT);
  pinMode(m2,OUTPUT);
  pinMode(buz,OUTPUT);
  digitalWrite(buz,0);
  digitalWrite(m1,0);
  digitalWrite(m2,0);
```

```
 lcd.begin(16,2);
 lcd.setCursor(4,0);
 lcd.print("WELCOME");
 lcd.setCursor(0,1);
 lcd.print(" ..... ");
 delay(1000);
 lcd.clear();
 while (!Serial);  // For Yun/Leo/Micro/Zero/...
 delay(100);
 Serial.println("\n\nAdafruit Fingerprint sensor enrollment & Verify");
 finger.begin(57600);
 if (finger.verifyPassword()) {
  lcd.setCursor(0,0);
  lcd.print("FOUND FP SENSOR!");
  delay(1000);
 } else {
  lcd.setCursor(0,0);
  lcd.print("FP SENSOR  ");
  lcd.setCursor(0,1);
  lcd.print("     NOT FOUND!");
  delay(1000);
  while (1) { delay(1); } }
lcd.setCursor(0,0);
lcd.print("BIOMETRIC IGNTION");
lcd.setCursor(0,1);
lcd.print("  .. CONTROL ..  ");
 delay(1000);
 lcd_msg(); }
void loop()  {                // run over and over again
 if(digitalRead(en_sw)==0){
  if(ch_status==false){
   if(id >= 3){
    lcd.setCursor(0,0);
    lcd.print("Exceed Enroll    ");
    lcd.setCursor(0,1);
    lcd.print("Limit ");lcd.print(id);
    lcd_msg();       }
   if(id >= 0 && id < 3){
    id++;
    id_val++;
     lcd.setCursor(0,0);
     lcd.print(F("Enrolling Id:      ")); lcd.setCursor(0,1); lcd.print(id); lcd.print(F("  "));
     //Serial.print(F("Enrolling ID # "));
     //Serial.print(id);
     while(p==-1) {
     p=getFingerprintEnroll();  }
```

```
      ch_status=true;
      p=-1; }}
    else{
      ch_status=false;
      p=-1; }}
  if(digitalRead(ver_sw)==0) {
     lcd.setCursor(0,0);
     lcd.print("Scan Your Finger");
     delay(2000);
     finger.getTemplateCount();
     int ID;
     ID=getFingerprintIDez();//returns  Finger Id
     delay(500);           //don't ned to run this at full speed.
        if(ID==1){
         Serial.println(F("Match Found With ID 1"));
         u1++;
         if(u1%2!=0){
         Serial.println("Match Found With ID 1");
         lcd.setCursor(0,0);
         lcd.print("MATCH FOUND USR1");
         lcd.setCursor(0,1);
         lcd.print("IGNITION ON     ");
         digitalWrite(m1,1);
         digitalWrite(m2,0);
         flag1 = 1;  }
         if(u1%2==0){
         Serial.println("Match Found With ID 1");
         lcd.setCursor(0,0);
         lcd.print("MATCH FOUND USR1");
         lcd.setCursor(0,1);
         lcd.print("IGNITION OFF     ");
         digitalWrite(m1,0);
         digitalWrite(m2,0);lcd_msg();
         flag1 = 0; }         }
       else if(ID==2){
         u2++;
         if(u2%2!=0){
         Serial.println("Match Found With ID 2");
         lcd.setCursor(0,0);
         lcd.print("MATCH FOUND USR2");
         lcd.setCursor(0,1);
         lcd.print("IGNITION ON     ");
         digitalWrite(m1,1);
         digitalWrite(m2,0);
         flag1 = 1;}
         if(u2%2==0){
```

```
          Serial.println("Match Found With ID 2");
          lcd.setCursor(0,0);
          lcd.print("MATCH FOUND USR2");
          lcd.setCursor(0,1);
          lcd.print("IGNITION OFF     ");
          digitalWrite(m1,0);
          digitalWrite(m2,0);lcd_msg();
          flag1 = 0; }  }
        else if(ID==3){
          u3++;
          if(u3%2!=0){
          Serial.println("Match Found With ID 3");
          lcd.setCursor(0,0);
          lcd.print("MATCH FOUND USR3");
          lcd.setCursor(0,1);
          lcd.print("IGNITION ON     ");
          digitalWrite(m1,1);
          digitalWrite(m2,0);
          flag1 = 1; }
          if(u3%2==0){
          Serial.println("Match Found With ID 3");
          lcd.setCursor(0,0);
          lcd.print("MATCH FOUND USR3");
          lcd.setCursor(0,1);
          lcd.print("IGNITION OFF     ");
          digitalWrite(m1,0);
          digitalWrite(m2,0);lcd_msg();
          flag1 = 0;  }   }
        else{
          Serial.println("Match Not Found");
          beep(3);
          lcd.setCursor(0,1);
          lcd.print("MATCH NOT FOUND ");delay(1000);
          lcd.setCursor(0,1);
          lcd.print("PLS. TRY AGAIN  "); delay(1000);
          lcd_msg();
          } }    }// Loop End
    \\ Enroll //
uint8_t getFingerprintEnroll() {
//Serial1.print(F("Waiting for valid finger to enroll as #")); Serial1.println(id);
  Serial.print(F("Enrolling ")); Serial.print(id);
  delay(1000);
  while (p != FINGERPRINT_OK) {
    p = finger.getImage();
    switch (p) {
    case FINGERPRINT_OK:
```

```
    Serial.println(F("Image taken"));
    break;
   case FINGERPRINT_NOFINGER:
    Serial.println(F("."));
    break;
   case FINGERPRINT_PACKETRECIEVEERR:
    Serial.println(F("Communication error"));
    break;
   case FINGERPRINT_IMAGEFAIL:
    Serial.println(F("Imaging error"));
    break;
   default:
    Serial.println(F("Unknown error"));
    break;}  } // OK success!
  Serial.print(F("Remove Finger"));
  lcd.setCursor(0,0);
  lcd.print(F("Remove Finger   "));
  delay(1000);
  p = 0;
  while (p != FINGERPRINT_NOFINGER) {
   p = finger.getImage(); }
  Serial.print(F("ID ")); Serial.println(id);
  p = -1;
  Serial.println(F("Place same finger again"));
 //  Serial.print(F("Put Same Finger Again"));
  // lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(F("Put Finger Again"));
  delay(3000);
  while (p != FINGERPRINT_OK) {
   p = finger.getImage();
   switch (p) {
   case FINGERPRINT_OK:
    Serial.println(F("Image taken"));
    break;
   case FINGERPRINT_NOFINGER:
    Serial.print(F("."));
    break;
   case FINGERPRINT_PACKETRECIEVEERR:
    Serial.println(F("Communication error"));
    break;
   case FINGERPRINT_IMAGEFAIL:
    Serial.println(F("Imaging error"));
    break;
   default:
    Serial.println(F("Unknown error"));
```

```
   break;} }
// OK success!  // OK converted!
Serial.print(F("Creating model for #"));  Serial.println(id);
p = finger.createModel();
if (p == FINGERPRINT_OK) {
  Serial.println(F("Prints matched!"));
} else if (p == FINGERPRINT_PACKETRECIEVEERR) {
  Serial.println(F("Communication error"));
  return p;
} else if (p == FINGERPRINT_ENROLLMISMATCH) {
  Serial.println(F("Fingerprints did not matches"));
  delay(1000);
  Serial.print(F("Enroll Fail"));
  lcd.setCursor(0,0);
  lcd.print(F("FAIL TO ENROLL  "));
  if(id>0) { id--; }
  lcd_msg();
  return p;
} else {
  Serial.println(F("Unknown error"));
  return p; }
Serial.print(F("ID ")); Serial.println(id);
p = finger.storeModel(id);
if (p == FINGERPRINT_OK) {
  Serial.println(F("Stored!"));
  Serial.print(F("Enroll Success"));
  lcd.clear();
lcd.setCursor(0,0);
lcd.print(F("Enroll Success ")); lcd.setCursor(0,1);lcd.print(id);lcd.print("    ");delay(2000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print(F("Enroll -- Verify"));
return p;
} else if (p == FINGERPRINT_PACKETRECIEVEERR) {
  Serial.println(F("Communication error"));
  return p;
} else if (p == FINGERPRINT_BADLOCATION) {
  Serial.println(F("Could not store in that location"));
  return p;
} else if (p == FINGERPRINT_FLASHERR) {
  Serial.println(F("Error writing to flash"));
  return p;
} else {
  Serial.println(F("Unknown error"));
  return p;
}   }
```

```
////  Enroll End  ////  Verify
uint8_t getFingerprintID() {
  uint8_t p = finger.getImage();
  switch (p) {
    case FINGERPRINT_OK:
      Serial.println(F("Image taken"));
      lcd.setCursor(0,1);
      lcd.print(F("Image Taken"));
      break;
    case FINGERPRINT_NOFINGER:
      Serial.println(F("No finger detected"));
      lcd.setCursor(0,1);
      lcd.print(F("NO FINGER      "));
      return p;
    case FINGERPRINT_PACKETRECIEVEERR:
      Serial.println(F("Communication error"));
      return p;
    case FINGERPRINT_IMAGEFAIL:
      Serial.println(F("Imaging error"));
      return p;
    default:
      Serial.println(F("Unknown error"));
      return p;  } // OK success!
// returns -1 if failed, otherwise returns ID #
int getFingerprintIDez() {
  uint8_t p = finger.getImage();
  if (p != FINGERPRINT_OK)  return -1;
  p = finger.image2Tz();
  if (p != FINGERPRINT_OK)  return -1;
  p = finger.fingerFastSearch();
  if (p != FINGERPRINT_OK)  return -1;
  // found a match!
 // Serial.print(F("Found ID #")); Serial1.print(finger.fingerID);
  Serial.print(F(" with confidence of ")); Serial.println(finger.confidence);
  return finger.fingerID;
}
/////////////// Verify End ////////////////////
```

# Chapter – 4

## Advantages

- Personalisation of the user interface strengthens the emotional bond between owners and their vehicle, making it uniquely theirs. In an important way it also improves the driver's ability to make use of the sophisticated features and functions in a car, many of which in today's cars are hidden behind multi-layered menu structures and complex sets of commands. Research has shown that for every step added to a user interface, 10% of the users drop out.

- Personalisation via a fingerprint sensor reduces the number of steps to one or even none for many aspects of the user interface, thus making valuable features much more readily accessible to users.

## Applications

- The obvious assumption about fingerprint sensing in the car is that it should be used as a convenient and secure replacement for the key both for providing access to the cabin and for starting the engine.

- In the smartphone, of course, fingerprint sensing performs this security function, barring access to any person other than the registered owner.

# Chapter – 5

## Conclusions

This work is a well operating prototype of a fingerprint based vehicle staring 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.

## Future Scope

- This can also be implemented in other automobiles apart from cars.
- Others types of bio-metrics can also be used.

# References

1) AjinkyaKawale, “Fingerprint based locking system”, International Journal of Scientific & Engineering Research

2) Karthikeyan.A & Sowndharya.J, “Fingerprint Based Ignition System”, International Journal Of Computational Engineering Research,