# Vehicle Anti-Theft Hand Brake System Using Finger-Print Scanner

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***Abstract*- Vehicle theft is a problem as old as the origin of them. Over the last few decades, car manufacturers around the world are searching new ways to solve this problem. Some technologies like gear lock, steering wheel lock, central locking system and different type of alarms have been introduced but theft problem still persists. We have developed a finger-print based anti-theft hand brake system which is capable of stopping the theft problems. This system can directly be changed with the lever based hand brake system currently being used in most of the vehicles. In currently available hand brake system we pull the lever of hand brakes to engage them and press a button given on top and push the lever downwards to disengage the hand brakes. But in our system one need to push down a big button like structure to engage hand brakes. Now for disengaging the hand brakes person will need to input his finger-prints by scanning the finger to the scanner provided on top of that button. If the prints will match, the system will automatically disengage the hand brakes.**

**Index Terms- Finger-Print Module, Arduino, Servo Motors, LCD, Circuit Diagram, Coding.**

## I. INTRODUCTION

Vehicle theft had been a big problem since the origin of them. Moreover it had rapidly grown over a few decades. According to Times of India "A vehicle was stolen every 13 minutes in capital Delhi (India) in the first three months of the year 2017, marking a sharp 44% rise over the same period last year" [1]. Over the time different methods have been used to tackle this problem but it still persists. Some technologies like gear lock, steering wheel lock, central locking system and different alarm technologies have been introduced but theft problem has only grown. Finger-print scanners are also given in some of the cars on doors but these could not solve the issue as it was still easy for a thief to break the window and go inside the car which most of the thieves do. Looking at all these issues we made an anti-theft hand brake system which could solve all these issues and could save our vehicle from theft problems.

Our system is a complete hand brake system which will completely replace the currently lever based hand brake system. The complete lever system before brake wire will be changed with our system and the brake wire will be attached to the brake wire of our system. The complete system will be covered by a hard to brake steel box. This box will be fitted at the time of manufacturing the vehicle such that only the big button like structure is visible to the driver. This big button like structure is to be pressed which will pull the brake wire and the hand brakes get engaged. Now when we touch the finger-print scanner our finger-prints get scanned. Which are processed by the microcontroller. If the results match the already known finger-prints it give instruction to the servos to rotate from 180º to 0º. Our system gets the input voltage from the 12*v* battery present in the vehicle. We can add finger-prints of our family members and other trust worthy persons who drive that vehicle. Our coding supports fingerprints of two persons which can be increased using the coding. Every part used is inside that steel box. There are only two things which come out of the box which are brake wire and 12*v* battery input wire. This make the system difficult to hack and the system can't be disengaged without finger-prints. The brake wire and battery supply wire are also hard to find as the box can't be seen only the button can be. Here is a virtual model made by using Solidworks software.

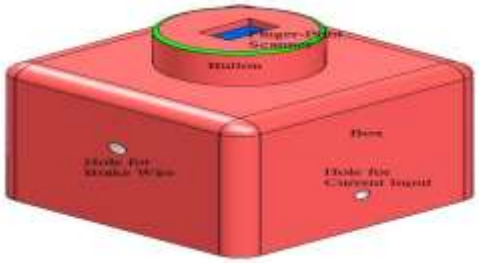


Fig. 1- Solidworks model of the system.

## II.TECHNICAL DESCRIPTION

The model we had established is a microcontroller based system. We had used LM 2596 module which provide required 5*v* input to different parts which works on 5*v* voltage like servos, LCD, Arduino. We have used LM 1117 module which convert 5*v* input to 3.3*v* for the finger-print scanner which runs on input of 3.3*v*. The system contain Arduino Nano to which all the parts are connected. This act as brain of the system. A 16*2 LCD screen is used which is used to show all the instructions. We have used two SG 90 servos which are connected to that button like structure. The brake wire is connected to that button. The setup is such that servos goes from 0 to 180 when we press the button. This pulls the brake wire connected to the button and hand brakes get engaged. But at the time of disengaging the hand brakes servos get the instruction from the Arduino which passes instructions after matching the finger-prints. Otherwise a message is shown of user not found. We have used GT-511C3 finger print scanner. The programing of the system was done using Arduino programming language.

### A. Procedure and Parts Used

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*Arduino nano*

The Arduino Nano is a small, and breadboard-friendly board. It is based on the ATmega328 (Arduino Nano 3.0). It has more or less the same functionality as that of the Arduino Duemilanove, but in a different package. Arduino Nano don't have a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Arduino Nano can be programmed with the Arduino software. The microcontroller on the board is programmed using the Arduino programming language. Figure 2 shows the real photo of Arduino Nano 3.0.

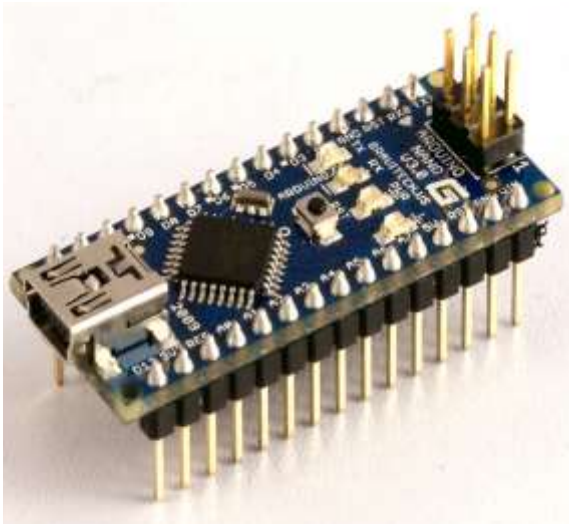

Fig. 2- Arduino nano 3.0.

*Finger-print scanner (GT-511C3 FPS)*

The GT-511C3 type finger-print scanner is a small embedded module. It consists of an optical sensor mounted on a small circuit board. The optical sensor scans the finger-prints and the microcontroller and software provides the functionality to the module which automatically processes the scanned fingerprint. The effective area of the sensor is 14*12.5 *mm*. A total of 200 finger-prints can be added. False acceptance rate is less than 0.001%. Interface of this finger-print scanner is very basic and consist of only four pins i.e. power, ground, serial transmit and serial receive. When we connect it to our microcontroller which uses 5*v* levels on its pins, a level converter has been used which reduce the 5*v* output from the microcontroller to 3.3*v* for finger-print scanner module because it can work only on 3.3*v* on its UART pins. Figure 3 shows the real photo of the finger-print scanner.


Fig. 3- Finger-print scanner and its pins.

*Servos (SG 90)*

These servo motors are very small and light in weight. They also have high output power. They rotate around 180º (90º in each direction) in our case else they can even rotate for around 210º. We can use any servo code, hardware or library to control these servos. These are really good for making things move without building a motor controller with feedback & gear box. As we can't use large space because complexities in nearby area and these fit in small places as shown in Figure 4. It comes with 3 horns (arms) and hardware. The above mentioned features make it fit for use. For better controls we had used two SG 90 servos. All the dimensions in Figure 4 are in *mm*.

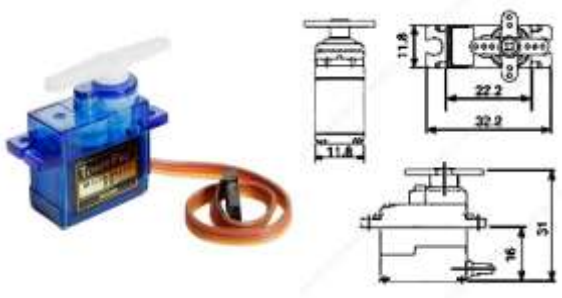

Fig. 4- SG 90 servo and its dimensions.

*LM 2596 module*

This series of regulators is monolithic integrated circuit series which provide all the active functions for a step-down switching regulator. It is capable of driving around 3*A* load and shows excellent line and load regulation. These are available in various fixed output voltages of 3.3*v*, 5*v*, 12*v* and also an adjustable output version. We had used it for providing 5*v* output for our circuit to run. It changes 12*v* coming from vehicles battery to 5*v*. Figure 5 shows photo of LM2596 module. We had used a level shifter which covert 5*v* to 3.3*v* for finger-print scanner.

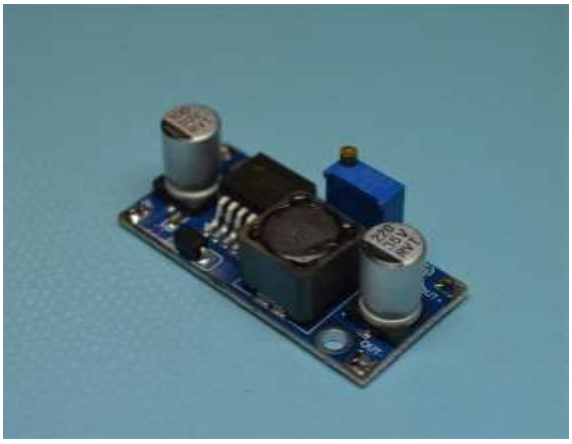

Fig. 5- LM2596 module.

*16*2 LCD display*

LCD screen is an electronic display module. LCD stands for liquid crystal display. We have used a 16*2 LCD which is very basic module and is commonly used with various devices and circuits. LCDs are very economical and easily programmable. They don't have any limitation of displaying even custom characters which is not supported by seven segments. A 16*2 LCD can display 16 characters per line. It have 2 such lines. Each character in this LCD is displayed in 5*7 pixel matrix.

B. Circuit

The 12V input from battery comes directly to LM2596 module. LM 2596 module is connected to the Arduino Nano. All the other parts (LCD, SG 90 servos) are directly connected to the Arduino Nano board. Finger-print scanner is not connected directly to the Arduino board. We have connected a level shifter in between finger-print scanner and Arduino Nano as shown in Figure 6.

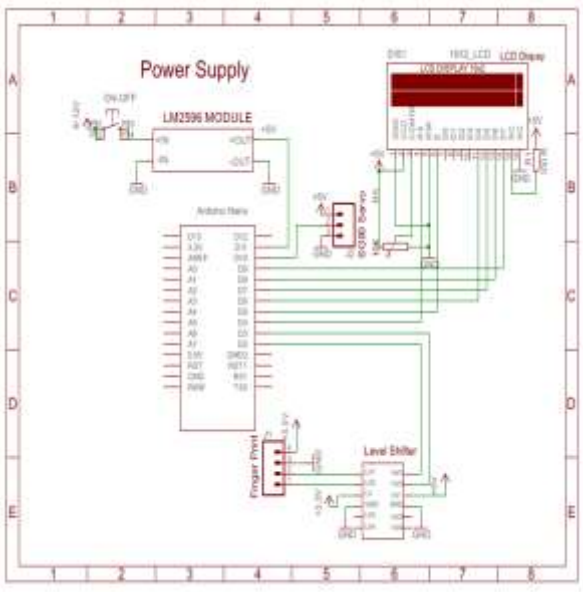


Fig. 6- Descriptive circuit diagram.

C. Programming

```
#include "FPS_GT511C3.h"
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
#include <Servo.h>

Servo myservo;
LiquidCrystal lcd(4, 5, 6, 7, 8, 9);
FPS_GT511C3 fps(2, 3);
int jumPin = 11;      //Fingerprint Jumper
//*****************************************
void lcd_init()
{
 lcd.begin(16, 2);
 lcd.print(" Fingerprint ");
 lcd.setCursor(0, 1);
 lcd.print("Based Anti Theft");
 delay(5000);
 lcd.clear();
}
//*****************************************
void Enroll(int val)
{
 int enrollid = val;
 fps.EnrollStart(enrollid);
 lcd.clear();lcd.print("User:");lcd.print(enrollid+1);
 lcd.setCursor(0, 1);lcd.print("Press Finger ");
 while(fps.IsPressFinger() == false) delay(100);
 bool bret = fps.CaptureFinger(true);
 int iret = 0;
 if (bret != false)
 {
  lcd.setCursor(0, 1);lcd.print("Remove Finger ");
  fps.Enroll1();
  while(fps.IsPressFinger() == true) delay(100);
  lcd.setCursor(0, 1);lcd.print("Press Finger ");
  while(fps.IsPressFinger() == false) delay(100);
  bret = fps.CaptureFinger(true);
  if (bret != false)
  {
   lcd.setCursor(0, 1);lcd.print("Remove Finger ");
   fps.Enroll2();
   while(fps.IsPressFinger() == true) delay(100);
   lcd.setCursor(0, 1);lcd.print("Press Finger ");
   while(fps.IsPressFinger() == false) delay(100);
   bret = fps.CaptureFinger(true);
   if (bret != false)
   {
    iret = fps.Enroll3();
    if (iret == 0)
    {
     lcd.setCursor(0, 1);lcd.print("Enroll Done ");
     delay(3000);lcd.setCursor(0, 1);lcd.print("
");
    }
    else
    {
     lcd.setCursor(0, 1);lcd.print("Enroll Fail ");
     delay(3000);lcd.setCursor(0, 1);lcd.print("
");
    }
   }
  }
 }
}
//*****************************************
void setup()
{
 Serial.begin(9600);
 Serial.println("Program Started");
 pinMode(jumPin, INPUT);digitalWrite(jumPin,
HIGH);
 myservo.attach(10);myservo.write(180);
 lcd_init();
  fps.Open();
 fps.SetLED(true);
  if(digitalRead(jumPin)==LOW)
 {
  lcd.clear();lcd.print("Enroll Start");
```

```
   Serial.println("[Enrol Start]");
   delay(2000);
   fps.DeleteID(0);
   fps.DeleteID(1);
   delay(1000);
   for(int i=0;i<2;i++)
   {
    Enroll(i);
   }
  }
 lcd.clear();lcd.print("  Place Finger  ");
}
//*****************************************
void loop()
{
 if (fps.IsPressFinger())
 {
  fps.CaptureFinger(false);
  int id = fps.Identify1_N();
  if (id < 2)
  {
   lcd.clear();lcd.print("User Match :
");lcd.setCursor(13, 0);lcd.print(id+1);
    myservo.attach(10);myservo.write(0);
    delay(6000);
    lcd.clear();lcd.print("  Place Finger  ");
  }
  else
  {
    lcd.clear();lcd.print("User Not Found  ");
    delay(6000);
    lcd.clear();lcd.print("  Place Finger  ");
  }
 }
}
//*****************************************
```

## III.CONCLUSION

No such systems have ever been built which could solve the vehicle theft issues. There were a lot of systems made to stop thieves but they could not succeed as discussed before. Our system can give the best safety as only the person whose fingerprints will match will be able to run the car. The system is capable of doing both the functions as hand brake system as well as an anti-theft system. The system take less space than the lever based hand brake system currently used in vehicles. This system can't be failed by providing external electric supply or by any other way. The system is capable of providing the best safety to the vehicle in the lowest cost of around 1000 INR which can be paid even by the owner of a 1 lakh INR car. The functioning of hand brakes will not get disturbed anyway. The system is so fast while functioning that it can be used even in a stunt vehicle. The complete system runs with the input of 12*v* DC supply which make the system practically possible to use in the current system of the vehicles as all of them uses 12*v* DC supply by a battery or two. The system can be used with the vehicles which have hand brakes example: (cars, trucks, buses, etc.). The above mentioned features make this system best anti-theft system ever built for the vehicles.

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