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FINGERPRINT VEHICLE STARTER WITH THEFT MONITORING

Shweta Tanaji Bhosale[1], Sayali Sanjay Thorat[2], KhocharePratiksha Prakash[3]

[1,2,3]BE (E&Tc) Students, ADCET, ASHTA, Maharashtra State, India

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Abstract - *There have been a lot of vehicle thefts and recovering of these vehicles is a big headache both for the owner as well as the police authorities. Thieves use different techniques to change the vehicle's appearance as well as using different parts of the vehicle and selling it and so on. So we aim to design a system that will give additional level of security to the owners thus preventing theft. This can be done by making sure that only the persons approved by the owner gets access to the vehicle and also the owner should be notified by the use of hidden techniques that the vehicle has been accessed by means of some physical damage.*

Key Words: Smart Vehicle, Security system, Finger print sensor, Arduino, Relay.

1. INTRODUCTION

Vehicle security is an important issue these days due to the rising number of vehicle thefts. Once the vehicle is stolen recovering it is quite difficult. Parts go missing and moreover many vehicles are never found. Also the cost involving goes high and hence we can look for a system that will make it more secure and hence prevent the vehicle thefts.

The system only allows authorized users to start the vehicle. Users can first register into the system by scanning fingerprints. The system allows multiple users to register as authorized users. When into monitoring mode, the system checks for users to scan. On scanning, the system checks if user is authorized user and starts vehicle for authorized users only. Here we use an atmega 32 microcontroller. The fingerprint sensor is connected to the microcontroller and also we have an LCD display along with push buttons and starter motor. The motor is used to demonstrate as vehicle starter. This system automates as well as vehicle security using fingerprint based system.

1.1 OBJECTIVES

The objective of this project is that, to change in the traditional starter system and make vehicles more secure. The objectives are as-

1. Prevention of Vehicle thefts
2. Increase in Vehicle Security

1.2 MOTIVATION

The high end vehicles have a very good level of security however; it is not the case with common vehicles as they have a very low level of security. We as electronics and telecommunication engineers feel that we can add high security to these vehicles at a very low cost thus preventing the thefts. Just by use of fingerprint and proximity sensors, microcontrollers, and GSM technology this can be achieved in almost every vehicle. We can also use a wide variety of different sensors to increase the security of these vehicles.

2. LITERATURE SURVEY

The history of fingerprint started in China. That was when the first record of the technique 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).

Sir Edward Henry, Inspector General of the Bengal Police, was in search of a method of identification to implement concurrently or to replace anthropometries. Henry consulted Sir Francis Galton regarding fingerprinting as a method of identifying criminals. Once the fingerprinting system was implemented, one of Henry"s workers, AzizulHaque, developed a method of classifying and storing the information so that searching could be performed easily and efficiently. Sir Henry later established the first British fingerprint files in London. The Henry Classification System, as it came to be known, was the precursor to the classification system used for many years by the Federal Bureau of Investigation (FBI) and

other criminal justice organizations that perform tenprint fingerprint searches.

In 1969, the Federal Bureau of Investigation (FBI) began its push to develop a system to automate its fingerprint identification process, which was quickly becoming overwhelming and required many man-hours. The FBI contracted the National Institute of Standards and Technology (NIST) to study the process of automating fingerprint identification. NIST identified two key challenges: (1) scanning fingerprint cards and identifying minutiae and (2) comparing and matching lists of minutiae.

3. SYSTEM DEVELOPMENT

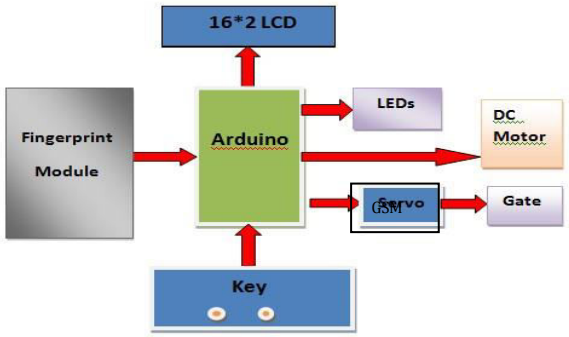


Fig 1.Block diagram ofVehicle security system

The main components of Vehicle security system consists of

- Arduino UNO
- GSM
- DC motor
- Fingerprint Sensor
- LED display
- Relay

The above Block diagram can be explained as follows The Fingerprint sensor will scan continuously for fingerprints. Once it receives a valid fingerprint it will display a welcome message for the user on the led display. Then the Arduino will send the control signal to the relay turning on the vehicle. A message will be displayed on the screen to remove the finger.

3.1 HARDWARE DESIGN:

3. 1.1.Arduino

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. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. **3.1.1.1 Pins General Pin functions**

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjunction with a breadboard and some wire. They usually have black plastic „headers" that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labelled on the board and used for different functions.

- **GND (3)**: Short for „Ground". There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- **5V (4) & 3.3V (5)**: As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 3.3 volts.
- **Analog (6)**: The area of pins under the „Analog In" label (A0 through A5 on the UNO) is Analog In pins. These pins can read the signal from an analog sensor and convert it into a digital value that we can read.
- **Digital (7)**:Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).
- **PWM (8)**: You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM).
- **AREF (9)**: Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.
- **Reset Button:**Just like the original Nintendo, the Arduino has a reset button **.**Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn"t repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduinodoesn"t usually fix any problems.
- **Power LED Indicator:** Just beneath and to the right of the word "UNO" on circuit board, there"s a tiny LED next to the word „ON" **.**This LED should light up whenever you plug your Arduino into a power source. If this light doesn"t turn on, there"s a good chance something is wrong. Time to re-check circuit.

- **TX RX LEDs:**TX is short for transmit, RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear – once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs .These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data.

Special Pin Functions

Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pin Mode(),digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function.

In addition, some pins have specialized functions:

- **Serial /UART**:pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts**: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM (Pulse Width Modulation)**: 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.
- **SPI (Serial Peripheral Interface)**: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI (Two Wire Interface) /I²C:**A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- **AREF (Analog REFerence):**Reference voltage for the analog inputs.

3.2.2. Fingerprint Sensor(R305)

3.2.2.1 INTRODUCTION

Power	DC 3.6V-6.0V	**Interface**	UART(TTL logical level)/ USB 1.1
Working	Typical: 100mA	**Matching**	1:1 and
current	Peak: 150mA	**Mode**	1:N
Baud rate	(9600*N)bps, N=1～12 (default N=6)	**Character file size**	256 bytes
Image acquiring time	**<0.5s**	**Template size**	512 bytes
Storage capacity	256	**Security level**	5 (1, 2, 3, 4, 5(highest))
FAR	**<0.001%**	**FRR**	**<0.1%**
Average searching time	<1s (1:1000)	**Window dimension**	18mm*22mm
Working environment	Temp: -10℃ +40℃ RH: 40%-85%	**Storage environment**	Temp: -40℃ +85℃ RH: 40%-85%
Outline Dimention	Split type Module: 32*23*7mm Sensor:56*20*21.5mm Integral type 54.5*20.6*23.8 mm	Sensor:56*20*21.5mm Integral type 54.5*20.6*23.8 mm	

3.2.2.2Operation Principle

First we have to enroll the fingers by using add finger buttons. Then whenever we want to start the bike press start key, then one welcome SMS will be send to the owner. Then we have to keep finger on sensor, then press search key to identify the finger. If finger is identified then start the bike and send SMS to owner , that bike is successfully started by authorized person.

But if finger is not matched or not identified then bike will not start and send SMS to owner, that bike is not started successfully and some unauthorized person is trying to start the bike.

3.2.2.3Exterior Interface

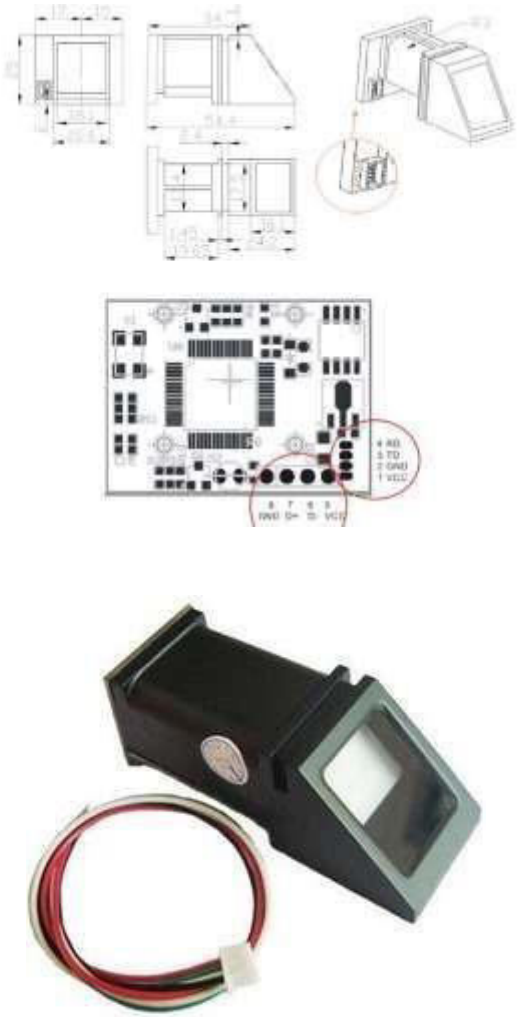
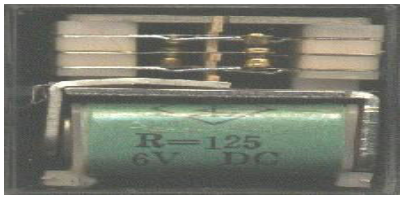


Fig.2 Finger Print Sensor

Fingerprint processing includes two parts: fingerprint enrollment and fingerprint matching (the matching can be 1:1 or 1:N). When enrolling, user needs to enter the finger two times. The system will process the two time finger images, generate a template of the finger based on processing results and store the template. When matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. For 1:1 matching, system will compare the live finger with specific template designated in the Module; for 1:N matching, or searching, system will search the whole finger library for the matching finger. In both circumstances, system will return the matching result, success or failure. The fingerprint sensor is combination of R305 FP+PIC MCU board that can read different fingerprints and store in its own flash memory. The sensor can perform three functions namely Add(Enroll), Empty Database or Search Database and return the ID of stored fingerprint.

Relay



A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field, which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit, which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current; typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For further information about switch contacts and the terms used to describe them please see the page on switches. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

The supplier's catalogue should show you the relay's connections. The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT

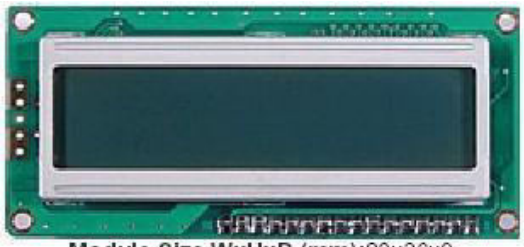
GSM MODEM:

GSM/GPRS Modem-TTL (5V) from rhydoLABZ is built with Tri-band GSM/GPRS engine, works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. It is very

compact in size and easy to use as plug in module. The Modem is coming with 5V TTL interface, which allows you to connect directly to 5V microcontroller/Arduino. The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. You need only two wire (Tx,Rx) except Power supply to interface with microcontroller/ Arduino. The built in Switching Power supply allows you to connect wide range unregulated power supply. Using this modem, you can send SMS, data and read SMS through simple AT command.

LCD:

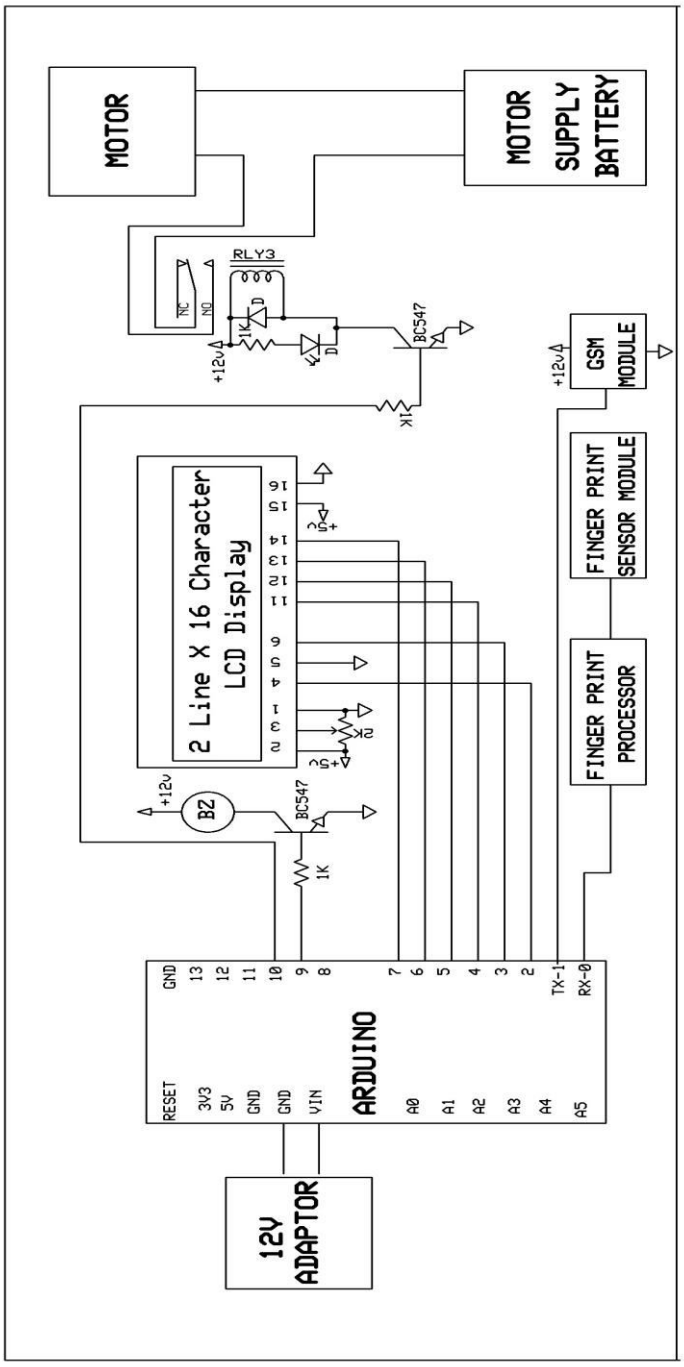
LCD's typically have 14 data pins and 2 for the LED backlight. Character LCDs use a standard 14-pin interface and those with backlights have 16 pins. There may also be a single backlight pin, with the other connection via Ground or VCC pin. The two backlight pins may precede the pin 1.The nominal backlight voltage is around 4.2V at 25°C using a VDD 5V capable model. Character LCDs can operate in 4-bit or 8-bit mode. In 4 bit mode, pins 7 through 10 are unused and the entire byte is sent to the screen using pins 11 through 14 by sending 4-bits) at a time..



Module Size WxHxD (mm):80x36x9

Viewing Area WxH (mm): 65x16

Overall Circuit Design



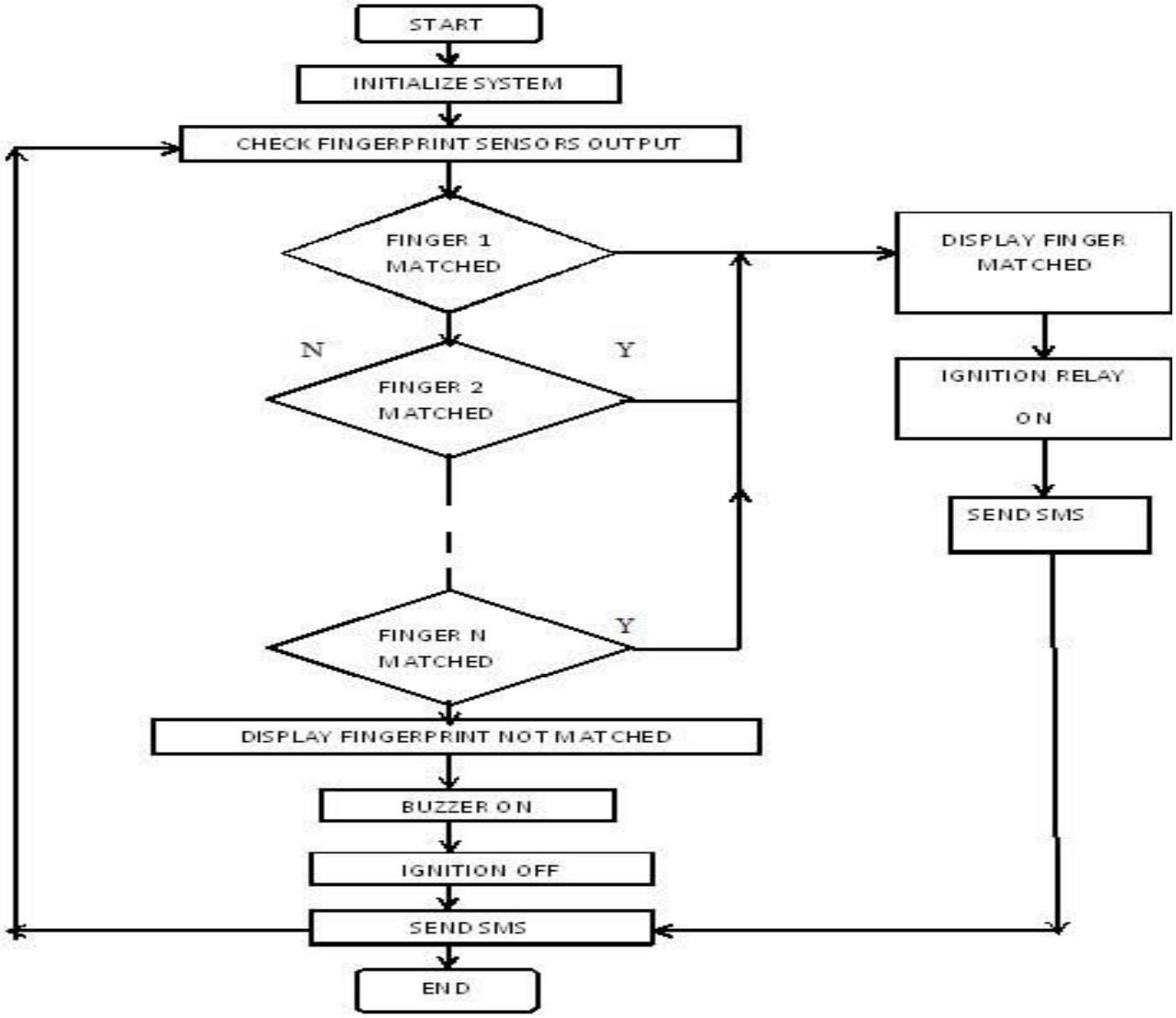


Fig 3. Flowchart for fingerprint storing and identification.

5. SUMMARY

5.1 Conclusion

By performing this project we can say that this project is used to start the bike by finger print only.If you place the proper finger then and then only bike will start and SMS will be send to owner that bike is started successfully. And if you place wrong finer the bike will not start and SMS will be send to owner that, some one un-authorized person is trying to start the bike.

5.2 Future scope:

Our project is about fingerprint based ignition in bikes which includes all two wheeler‟s. Normally available locks in the bikes do not provide enough security to the bike owners. Traditional locks available in the bikes are well known to thieves and they can be easily broken by them. Thus there is need for more security options to be available for the motorcycle which is unique and must be different from the traditional key locks.

5.2 Applications

- This project will be used in vehicles to make the vehicles more secure and prevent thefts.
- It can be used for all types of vehicles with very little modifications and is at low costthus not increasing the price of the vehicle by very much.

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