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Finger Print Based Vehicle Start Using Arduino

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ABSTRACT: There have been a lot of vehicle thefts andrecovering 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 physicaldamage.

KEYWORDS: Smart Vehicle, Security system, Finger printsensor, Arduino, Relay.

I. 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 vehiclethefts.

Most vehicles today are manufactured with built-in car alarms however it is still a great idea to keep up to date with the latest developments and improvements. A lot of older security systems can be bypassed by experienced car thieves, this is why it is important to upgrade your vehicle alarm system. Being an expensive asset, it is important that we protect our cars from thieves. As the main purpose of Vehicle Security System installation is to protect our vehicles and its contents, by using biometrics to start the vehicles and thus now it has authorized access only.

II. LITERATURESURVEY

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

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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.

III. SYSTEM DEVELOPMENT

The main components of Vehicle security system consists of

- Arduino Nano
- Fingerprint Sensor
- LCDdisplay
- Relay

The 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 LCD 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

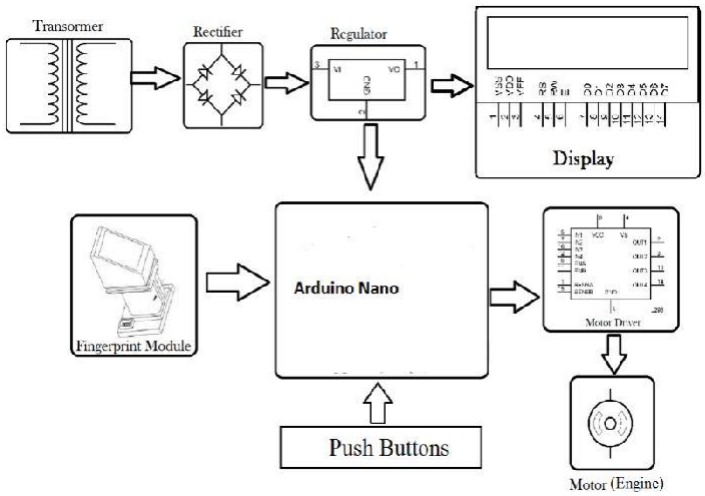

Fig. 1.Block diagram ofVehicle security system

IV. HARDWARE DESIGN

Arduino

The Arduino Nano is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.[4] It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a CreativeCommons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino

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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 Nano board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Nano comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

General Pin functions

- **LED**: There is a built-in LED driven by digital pin 13.When the pin is HIGH value, the LED is on, when the pin is LOW, it'soff.
- **VIN**: The input voltage to the Arduino/Genuino boardwhen it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through thispin.
- **5V**: This pin outputs a regulated 5V from theregulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage theboard.
- **3V3**: A 3.3 volt supply generated by the on-boardregulator. Maximum current draw is 50mA.
- **GND**: Groundpins.
- **IOREF**: This pin on the Arduino/Genuino boardprovides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shieldswhich block the one on theboard.

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 toreceive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serialchip.
- **External Interrupts**: pins 2 and 3. These pins can beconfigured to trigger an interrupt on a low value, a rising or falling edge, or a change invalue.
- **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 SPIlibrary.
- **TWI (Two Wire Interface) / I²C:**A4or SDA pin andA5 or SCL pin. Support TWI communication using the Wirelibrary.
- **AREF (Analog Reference):**Reference voltage for theanaloginputs.

Fingerprint Sensor(R305)

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;

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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 orfailure.

Exterior Interface

Fig.2. Finger Print Sensor

Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to per characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protectiverelays".

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Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands. It was used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another.

Basic design and Operations

SPDT Relay

Single Pole Double Throw (SPDT) Relay contains two coil terminals and common terminal, then two switching terminals N/O (Normally Open), N/C (Normally Close)If there is not enough DC supply in coil terminals then Relay represents idle condition that is common terminal connected in N/C terminal. When the coil gets required DC supply then coil gets Magnetically Energized and this magnetic flux force attracts common terminal lever which is made of iron and makes the connection to N/O terminal, now the N/C becomes open.

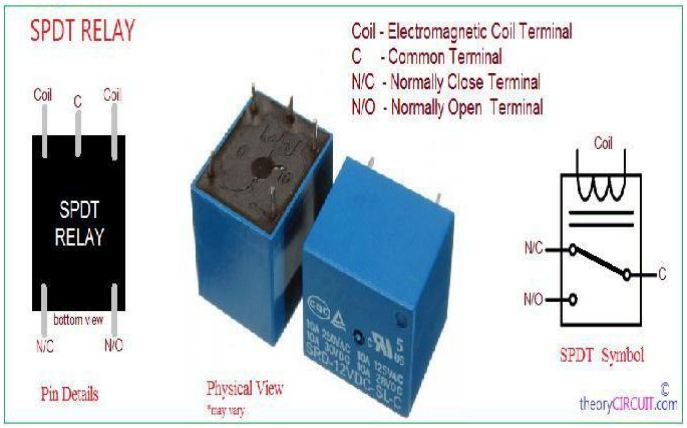

Fig. 3. SPDT Relay

V. SYSTEM OPERATION

The first step of operation is fingerprint identification.

The fingerprint identification process has two steps that is 1. EnrollingFingerprint.

Having the fingerprint sensor module wired to the Arduino, follow the next steps to enroll a new fingerprint. Make sure you've installed the Adafruit Fingerprint Sensor library previously.

1. IntheArduinoIDE,go
to **File**>**Examples**>**Ada fruit Fingerprint Sensor Library** >**Enroll**.

2. Upload the code, and open the serial monitor at a baud rate of9600.

3. YoushouldenteranIDforthefinger print. As thisisyour first fingerprint, type1atthetopleftcorner,andthen,click the **Send**button.

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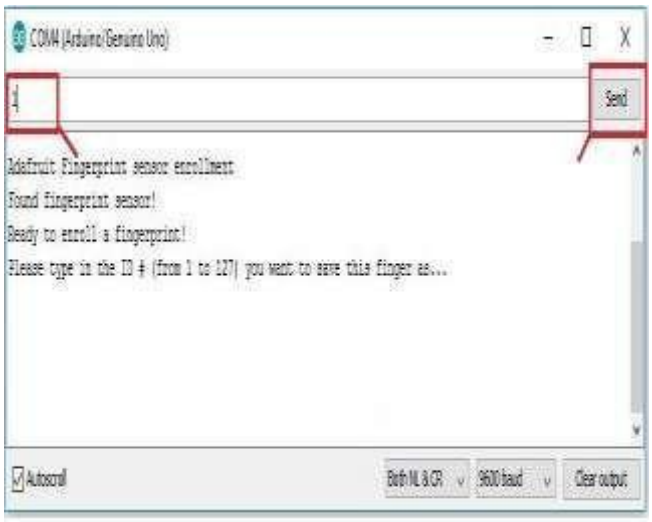

4. Place your finger on the scanner and follow the instructions on the serialmonitor.

Flowchart for fingerprint storing and identification.

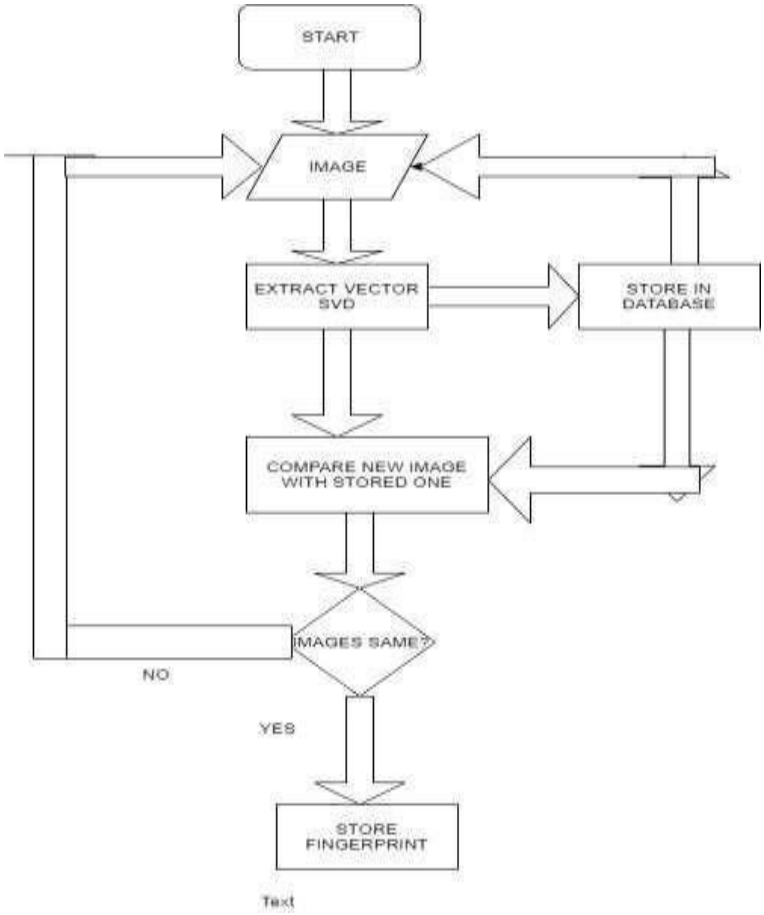

Fig. 4. Flowchart for fingerprint storing and identification.

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Matching Fingerprint.

Once we have stored the fingerprints the fingerprint sensor will keep on continuously scanning for fingerprint. Once it receives a valid fingerprint the Arduino will make relay output high, thus turning on the vehicle.

Expected Results at various stages

At first stage we expect the Arduino to be able to storethe finger print and then verify it. Once the fingerprint verification process is complete then we expect some sort of output signal from the Arduino which we can use to produce the ignition. Thus the vehicle will only start when an authorized person is accessing it.

VI. RESULTS AND DISCUSSION

Realizing a project physically has lots to do with research, choice of component and testing of the components. The project was implemented and tested to ensure proper operation under stated instruction. The various modules were tested and satisfactory results were obtained. As the components used fail within the tolerance value of the components, Hence an assurance of the proper functioning of the system. From the Fig.as depicted below, it shows that the designed system performs the measured values.

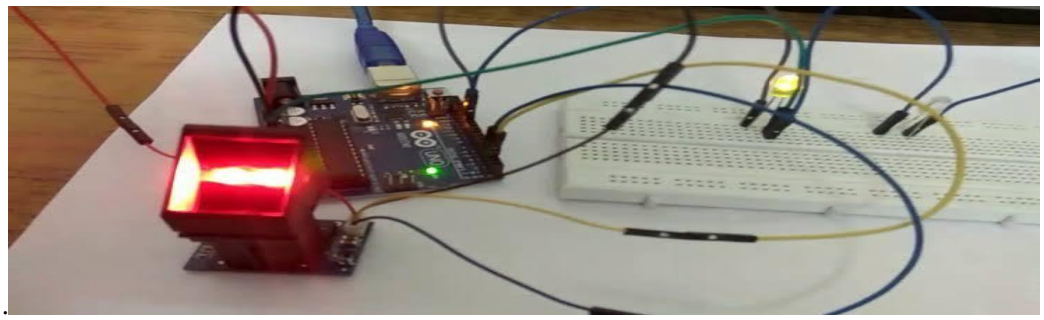

Fig. 5. Interfacing fingerprint with Arduino

VII. CONCLUSION

We have successfully able implemented this system and thus we can replace the traditional starter in Vehicles by more secure way and thus overcome its drawbacks. This system helps in making vehicle more secure and thus it will help in prevention of thefts.

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