



FINGERPRINT BASED VEHICLE SECURITY AND CONTROL

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ABSTRACT

Vehicle has become an indispensable part in life to keep pace with the fast moving world. Protection against unauthorized use and gearless easy control of speed constitute concern of the researchers. To protect the vehicle from any unauthorized access an economical fingerprint recognition technique is proposed herewith for keyless ignition of car. If the fingerprint of the user is verified then only he can use it. The multipurpose cost effective prototype model for the security system built on the microcontroller also serves for control of speed based on fingerprints. The change of speed of the vehicle using the different fingerprint images reduces the burden of manual gear shifting. This additional feature will help the physically disabled persons to independently drive a fourwheeler.

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INTRODUCTION

On reviewing the literature for security of automobiles, some are developed for preventing theft by automatic alarming or SMS [1]. For detection of theft and subsequent tracking different technologies such as GSM, GPS, RFID, Google earth mapping are proposed [1-8,10]. As per requirement of the data to be processed, different microcontroller or workstation PC are used. Some have focused on two wheeler security and some on fourwheeler security. Fingerprint identification is the most widely used in biometric technology. Automation system based on fingerprint recognition turned out to be successful in forensics and hence expanded the application of fingerprint in wide areas such as locking systems, attendance systems and identification systems. Fingerprint identification can also be applied to improve the security system by avoiding unauthorized access. Application of the fingerprint identification can be implemented in the car ignition system to provide a high security system to the car. The use of GSM is predominant but fingerprint is a more convincing, faster, secure and less expensive technique as seen in comparison to other identification [9] such as face detection [11]. Also detection of accident using sensors for temperature, alcohol and accelerometer connected to a buzzer in the vehicle, and failure of driver to stop, information can be sent to emergency numbers [12].

Herein, the fingerprints are endorsed beforehand in the fingerprint module. The result which is expected from the work is that the car will be ignited only when the scanned fingerprint matches that in the database. After the car starts the gear can also be shifted inputting different fingers on the sensor which is programmed in view of an ease to control in the memory of microcontroller. With no additional hardware, the same fingerprint system with microcontroller can be programmed to control the speed of the vehicle. An attempt has also been taken address this issue, which could ease the control and specifically help physically disabled person who cannot drive a car as such. The idea is implemented in laboratory on a small servo motor. The security is not limited to single person but a group of persons who is identified to use the vehicle. Other technologies such as alarm, intimation to user as presented in literature can also added as per requirement of the user.

Block Diagram of the Model

When the fingerprint of the user is scanned the fingerprint sensor sends a signal to the microcontroller which leads to ignition of the servo motor as shown in fig.1. Hence change in speed or speed control of the motor occurs in accordance with the change in fingers of the user.

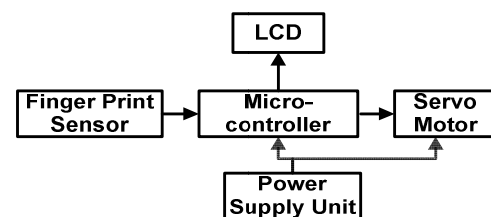


Fig 1 Block Diagram of the system

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Requirements

Finger print Sensor ZFM-20 series

Fingerprint sensor FPS-GT-511c3 is manufactured by ADH-Tech. It is an optical fingerprint sensor which with a processor connected processes the fingerprint input quickly. The database can store up to 200 fingerprints.

Liquid Crystal Display (LCD)

It is a 2x16 green LCD display compatible with microcontroller.

Arduino UNO Microcontroller

Arduino is an open source platform, very useful for prototyping by engineers. As shown in fig.2, it consists of a physical board and IDE (Integrated development environment) for easy prototyping and checking of the codes. The coding for it is done in embedded C language. It consists of an ATMEGA328P microcontroller which is an 8-bit AVR RISC-based microcontroller. Rapid prototyping can be done as it uses a USB cable to upload new code from a personal computer. A power jack gets power at 5V.



Fig 2 Arduino UNO Microcontroller



Fig 3 Servo Motor

Servo motor

A servomotor is a rotary actuator as shown in fig.3 (SG90) that is normally used to control of angular position. In this experimental set up, it is used as a motor that runs at 4.8V which can be provided easily and represents the geared system of speed control of the vehicle. The dead time is 7 μ s which equals 1.26 degree. Changing the number of pulses in the code in accordance with gear of vehicles and corresponding speed range, the desired speed can be achieved. Individual jumper wires are fitted by inserting their end connectors into the slots provided in the boards to connect the parts of the set up.

SDK demo

SDK demo software for the FPS developed by the manufacturer can be run on Windows with the FPS connected by USB. It is loaded to the FPS after confirmation.

Arduino IDE

Arduino IDE is a opensource software. The project is written in the form of a sketch in the Arduino integrated development environment (IDE) [13] with the file extension.ino. After compiling, the *avrdude* program converts the executable code into a hexadecimal code that is loaded into the Arduino board by a loader program in the board's firmware.

Hardware Implementation

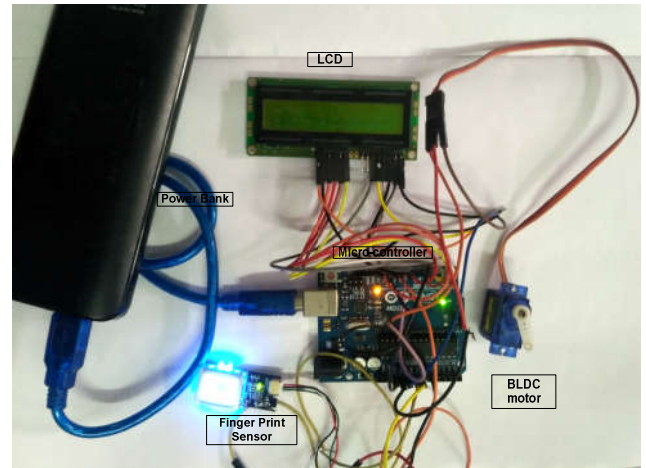


Fig 4 Circuit Connection Diagram

First of all the five fingers of right hand of all the probable users is scanned. It can also be done after installation within its capacity. Then through the transmitter pin (TX) the same signal of the scanned image of the finger is sent to data bus (D10) of the microcontroller. The fingerprint scanner is powered through a 3.3V pin of the microcontroller and after processing of the scanned image from the sensor the controller receives the feedback signal. The various messages for valid and invalid fingerprints are displayed on the LCD.

There is a servo motor that receives the signal from the digital pin D9 of the microcontroller and hence the speed of the motor is changed through the scanning of different fingers. The microcontroller, servo motor, fingerprint sensor and the LCD have been commonly grounded. The power bank provides power at 5V.

Algorithm

- Firstly the user will be asked to keep the fingers on the finger print scanner
- The system will scan the finger and will verify with already stored enrolled one
- The user can enroll as many number of fingers as he/she wants
- After verification, ignition will be activated automatically
- As per logic the same finger is used twice to start movement at lowest speed. If the finger is invalid then automatically the LCD display will show an error message of "invalid fingerprint"
- After the vehicle starts the speed of the motor of the vehicle can be changed by scanning different fingers of the user
- The gear keeps shifting along with increase or decrease of the speed of the vehicle

CONCLUSION

A fingerprint based secured ignition by authorized person is developed in hardware for a keyless car. Also the same sensor has been used for speed control which will be an added advantage towards gearless driving with specific advantage for people with physical disability. What more is required, the car is controlled at your finger tips. The proposed scheme has multipurpose utility. There are many improvements or functionalities that could be added on to the current version of this system to make it more efficient in terms of security, reliable operation and portability. It improves the existing system by reducing the cost of the existing and overcoming the conventional system. As an application, it can be used by authorized users in restricted entry area. Addition of more functionality would make it useful to be applied in other domains also.

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