

Authenticated Access Control for Vehicle Ignition System by Smart Card and Fingerprint Technology

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Abstract: Fingerprint identification is one of the most popular and reliable personal biometric identification methods. By using this biometric authentication, we can prevent non-licensees from driving and therefore causing accidents. The proposed system consists of a smart card capable of storing the fingerprint of particular person. While issuing the license, the specific person's fingerprint is to be stored in the card. Vehicles such as cars should have a card reader capable of reading the particular license. The same automobile should have the facility of fingerprint reader device. A person, who wishes to drive the vehicle, should insert the smartcard in the vehicle and then swipe his/her finger. If the fingerprint matches with the fingerprint stored in the smart card then it goes for alcohol detection and seatbelt checking. After passing all authentications, the vehicle will be ignited. The vehicle will not be ignited, if any one of the authentications fails and will not proceed the next step. This increases the security of vehicles and also ensures safe driving by preventing accidents. The prototype of the ignition system is used by the Master controller (Cortex M3 based Micro controller) is implemented along with the vehicle prototype is developed and the results are attached.

Keywords: Smart card reader, Fingerprint module, Alcohol sensor, Seatbelt detector

I. Introduction

Driving without driving license is a major issue in many countries. Survey says that the accidents happened mostly by the unlicensed drivers, drunken drivers and less usage of seatbelts. Owing to unsafe conditions on roads, the rate of accidents in India has been high. According to WHO statistics for 2002, out of about 11.8 lakh road accident deaths across the world, 84,674 deaths were reported from India alone. In 2004 the number of deaths had increased to 92,618. The mortality rate in India is 8.7 per hundred thousand populations as compared to 5.6 in UK, 5.4 in Sweden, 5.0 in The Netherlands and 6.7 in Japan. In terms of mortality per 10,000 vehicles, the rate in India is as high as 14 as compared to less than two in developed countries. The estimated number of deaths in India for the years 2005, 2006 and 2014 are 1,10,300, 1,05,725 and 1,54,600.

In existing method, keys were used to start the vehicle. By this method, vehicles can be stolen easily and unable to prevent accidents.

The proposed system consists of smart card (driving license) capable for storing the fingerprint of a particular person. While issuing the license, the specific person's fingerprint is to be stored in the card. First, the person should insert the smart card (driving license) and provide the finger print. If the fingerprint matches with the fingerprint stored in the smart card then it goes for alcohol detection and seatbelt checking. A person is checked by alcohol detector whether that person is drunk or not. Seat belt detector verifies and prompts the person to wear the seatbelt.

After passing all authentications, the vehicle will be ignited. The vehicle will not be ignited, if any one of the authentications fails and will not proceed the next step. The smart card reader do not accept the driving license if the driving license is having any one of the following issues.

- A. If the driving license validity is expired.
- B. If the driving license card is learner license.
- C. If the driving license card is blocked.

If the person is drunk or seat belt is not worn by the user then the ignition will turn off and gives a buzzer alert.

If the fuel level sensor is low or speed driven by vehicle is high then it gives a buzzer alert and display status of fuel level and speed on LCD display.

II. Related Work

A. Cortex-M3 Lpc1768

In this project, Cortex-M3 LPC1768 microcontroller acquires different parameters of vehicle. The main block of authenticated access control for vehicle ignition system is Cortex-M3 LPC1768 microcontroller which is heart of the system. The microcontroller is fed with the required input signals from various parameters. The various parameters send signals, each to individual pins of the microcontroller. The microcontroller then branches out to any one of the logical paths and delivers the output at one of its pins, which is used by ignition system unit. The controller is used to check the authentication process. All the devices are connected to the controllers to control the device actions. The LCD block is provided for displaying the fingerprint of smart card and the person.

Microcontroller will verifies the provided finger print of the person with the finger print stored in smart card. The controller did not accept the driving license card, if its validity is expired. It also do not allow the driving license card if the driving license is blocked for nay of the reasons. If the driving license date is going to expire, it will give the alert signal to the user about the expired status of the driving license card. When the person inserts the valid driving license and finger print is incorrect means, it does not accept the driving license.

B. Smart Card Reader

Smart card reader is interfaced to microcontroller in order to transmit and receive the signals to and from microcontroller. The smart card reader is capable of reading the finger print image present in the smart card. The smart card is stored with the finger print image of the person. The finger print of the person stored in the smart card is received by using the fingerprint reader. When the finger print of the person is received, the microcontroller will check for the matching of the finger print of the person and the finger print stored in the smart card.

D. Fingerprint Module

The fingerprint module used to read the finger print images. Here we are using KY-M6 fingerprint module. It can store 160 images. When the person put the finger on the reader, the LED will emit an IR rays. The hemoglobin in our blood absorbs the rays. The place where the IR rays are absorbed will be appeared as a dark and remaining will be light. Now the CCD camera below the fingerprint reader will capture the image appeared. It will send the signals to the microcontroller.

E. Alcohol Sensor

The alcohol sensor here using is MQ3. This sensor has high sensitivity, fast detection range. This sensor is specially used for detecting the alcoholic gases. If alcohol is detected then the signal will be sent to the microcontroller and a buzzer alert is given and vehicle is stopped immediately.

F. Seatbelt Detector

In this project we are using infrared emitters and detectors as seatbelt detector. An IR transmitter is designed through an IR led with a series resistance. The IR receiver section contains a photodiode which receives the IR rays and on the basis of IR intensity provides variation in voltage. The analog voltage obtained is in between its maximum and minimum operating range. This analog variation of voltage is fed to the microcontroller. Emitter in one knob and detector in another knob, when these two knobs are connected properly (i.e., detector detects the IR light) then only the vehicle will start otherwise it will not start.

G. Fuel Level Sensor

A fuel level sensor is an instrument used to indicate the level of fuel contained in a tank. In this project, fuel level sensor monitors the level of fuel on LCD display. When the fuel level is low, it will give buzzer alert and fuel level "L" will be displayed on LCD.

G. Speedometer

A speedometer is a gauge that measures and displays the instantaneous speed of a vehicle. Speedometers for other vehicles have specific names and use other means of sensing speed. In this project, we are using MOC7811. It consists of IR LED and Photodiode mounted facing each other enclosed in plastic body. When light emitted by the IR LED is blocked because of alternating slots of the encoder disc logic level of the photo diode changes. This change in the logic level can be sensed by the microcontroller. When the speed driven by vehicle is high, it will give buzzer alert and speed will be displayed on LCD.

III. System Implementation & Results

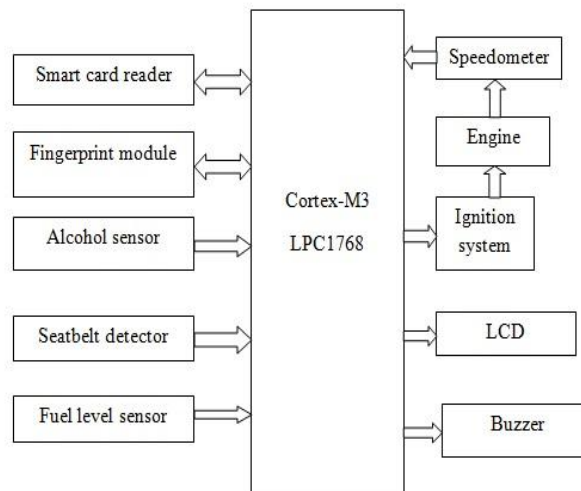


Fig 1. Block Diagram

Microcontroller plays an important role in this project. It receives the signals from the various parameters in form of bits and delivers the output. First, smart card is inserted in the smart card reader and fingerprint is provided. Then microcontroller will verify the provided fingerprint with the fingerprint stored in smart card. If both matches then it goes for alcohol checking and seatbelt checking. If all authentications are positive then the vehicle will be ignited. Being with these applications, fuel level sensor will indicate the level of fuel on LCD and Speedometer will indicate the speed driven by vehicle on LCD.

If the alcohol is detected or seatbelt is not connected then the vehicle will be turned off and buzzer is given, simultaneously message will be displayed on LCD.

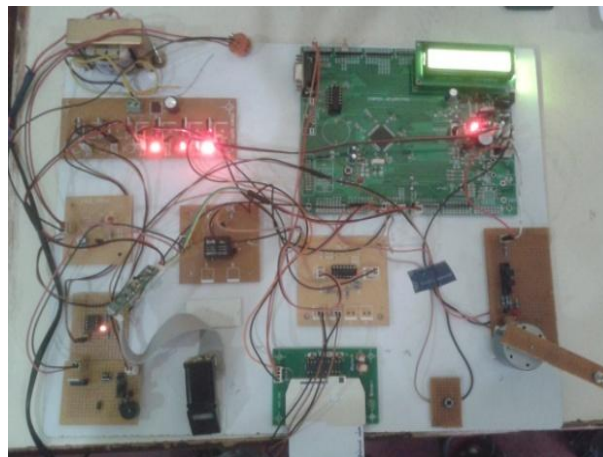


Fig 2. System Hardware

If the smart card (driving license) and provided fingerprint matches then the vehicle will be started. It will display the details of driving license, fingerprint and status of all parameters.



Fig 3. Driving license and fingerprint details shown on LCD display



Fig 4. Monitoring all parameters on LCD display

If the alcohol was detected or seat belt was not connected then the vehicle will be stopped immediately and it displays the message on LCD.



Fig 5. When alcohol was detected

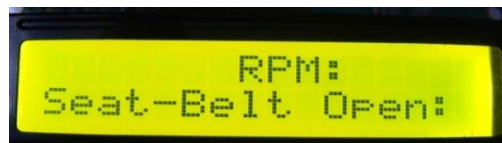


Fig 6. When seatbelt was open

IV. Conclusion & Futurescope

From this paper, I want to conclude that fingerprint was a secure biometric authentication and will be used for security purposes. By using this system, no one can drive without driving license and also no one can use the others driving license. In this method, the system will also alert the user about the validity period of the driving license. In cars, it also ensures that the seat belt is worn by the driver and if any person was drunk, can be checked by alcohol detector. This increases the security of vehicles and also ensures safe driving by preventing accidents. The present module can be interfaced with GPS and GSM module to find out vehicle location through mobile.

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Biography



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