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SECURING VEHICLES WITH FINGERPRINT BASED SECURITY

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ABSTRACT: In this age of soaring vehicle thefts, vehicle safety has become a matter of prime importance. Investigators owe this increase in thefts to the lack of proper parking spaces in residential areas and lack of availability of sophisticated security devices. As a solution to the aforementioned problem, we have developed a prototype model of a fingerprint-based security system for vehicles by interfacing Fingerprint sensor module R307 along with Arduino Uno. A person can start the vehicle, but only upon fingerprint authentication can the person put the vehicle into motion. In recognition of the fingerprint, the valve fixed in the outlet of fuel tank opens, thereby allowing the flow of fuel to the engine.
Keywords: Arduino Uno, fingerprint sensor R307, automobile security, microcontroller ATtmega328

I. INTRODUCTION

Automobile security is one of the growing concerns in India. Safeguarding of vehicle against theft is one of the major issues confronting developing countries. Varied techniques have been tried and tested to protect and secure the automobiles. Embedded computing is an emerging technology widely used in improving and enhancing security against the theft of vehicles. In 2013, Radiofrequency Identification (RFID) cards were designed for ignition start of automobile [1]. However, the chances of losing the card or it being stolen led to the failure of the system. Kulkarni et al. proposed a face detection subsystem with GPS and GSM module [2]. A digital camera was used to capture the video which was continuously uploaded into the web server using the ARM9 processor. AdaBoost algorithmFace detection was adopted in a security system to identify the person who is trying to start the vehicle. This methodology, however, proved to be error-prone in detecting those faces, not in front of the camera. Using the Global System for Mobile (GSM) and GPS technology, the vehicle can be identified and located very easily [3-8]. However, the main disadvantage is that the signal can become degraded and receiver system may not provide location due to poor weather conditions. Fingerprint recognition is an ideal biometric technology as it offers an accurate digital identification solution [9, 10, 11]. With high-speed matching algorithms and fast integration, this technology has been widely exploited to safeguard vehicles and identity fraud. In 2012, Karthikeyan et al. used a fingerprint sensor, (Fingerprint module 3030) along with microcontroller AT89c52 to validate the user [12]. Z. Brijet et al. combined Fingerprint sensor and Arduino. The connection from the ignition switch that supplies voltage is given to the voltage regulator which is connected to Arduino in-order to turn it on and off. Fingerprint sensor activated the relay which in turn controlled the starter relay resulting in the vehicle turning on. If the finger image does not match any of the images stored in the database, then the starting system is disabled [13]. In this work, we attempt to design a low-cost embedded system that allows only fingerprint authenticated users to put the vehicle in motion. Our system comprises of Arduino Uno, a Fingerprint Sensor Module, LCD Display, Servo Motor, Micro Switches and I2C Backpack. Arduino Uno receives and transmits data among the modules and coordinates the entire system. Fingerprint sensor module prompts the user to read his/her fingerprint and the pattern matching algorithm validates the authentic user. When a fingerprint match is found and the user authenticated, the valve attached to the fuel tank opens for the free flow of the fuel to the engine. This puts the vehicle in motion. The valve attached to the fuel tank operates (opens and closes) with the help of a server motor. The outputs of the system, directions to user and status of the system are displayed in the LCD Display.

II. PROPOSED MODEL

In this paper, we propose a novel method which uses a fingerprint control to put the vehicle in motion. All previous work related to security using fingerprint biometric acts upon ignition system. However, this security measure can be easily breached. It requires less effort to start the vehicle by directly manipulating the ignition wires kept behind the steering. Therefore rather than securing ignition, we have introduced a security measure that will only permit fingerprint authenticated users to put the vehicle in motion. The Fingerprint authentication is performed by the Fingerprint Module R307 sensor. Fingerprint Sensor Module has two sub-modules: fingerprint Enrolment/Addition and Fingerprint Recognition. Fingerprint enrolment/addition module adds and stores the fingerprints of all the users who are authorized to drive the vehicle. This sub-module enables fingerprint of valid users to be enrolled in the database. To facilitate enrolment, the Fingerprint Module R307 sensor has a micro switch with 3 buttons. The first button is used to captures the 3D image of the fingerprint. The other two buttons are used to add and delete a fingerprint stored in the database. Fingerprint matching sub-module compares the input fingerprint against one or more templates that are present in the database. The user is allowed 5 attempts. The fingerprint matching techniques used are minutiae-based matching and pattern matching. Before a user can run a vehicle, his/her fingerprint is matched against the fingerprint in the database. Fingerprint sensor Module R307 sends the signals to the microcontroller ATtmega328 of the Arduino Uno board. ATtmega328 microcontroller handles user authentication. Once the scanned fingerprint matches with the one stored in the database, the microcontroller sends the

desired signal to put the vehicle in motion. This is accomplished by turning on and opening the valve attached to the fuel tank. When an unauthorized user tries to run the vehicle, his/her fingerprint mismatches the valve attached to the fuel tank shuts down or closes thus disallowing him/her access. An LCD display is used which displays the status of the system. It also displays when the fingerprints are being added, deleted or a successful authentication. Figure 1 represents the block diagram of the system which comprises of the connectivity with the sensors, LCD, and power supply, All the hardware used to operate on +5V supply and therefore an additional IC has been used to control the flow of power supply for the proper functioning of the components.

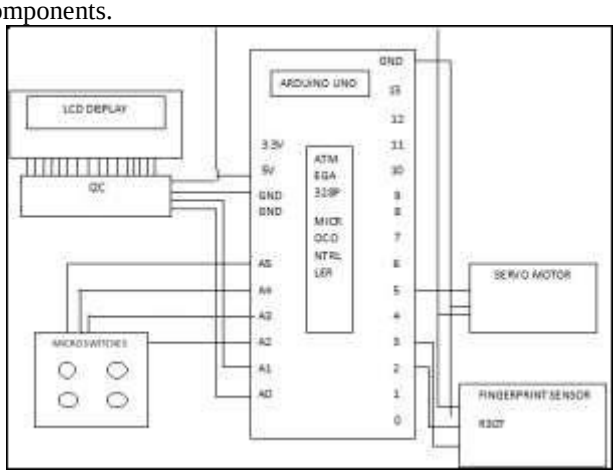

Fig. 1. Block diagram of the proposed system

III. HARDWARE COMPONENTS

3. 1 Arduino Uno

Arduino Uno circuit board with Arduino IDE is capable of reading analog or digital input signals from different sensors, activating the motor, turning LED on/off and do many other such activities. All functionalities are performed by sending a set of instructions to the ATtmega328 main microcontroller, on the board via Arduino IDE. The Arduino board also includes Power USB, Power (Barrel Jack), voltage regulator, crystal oscillator, voltage pins (3.3v,5v,gnd,vin), A0 to A5 analog pins, icsp pin, power led indicator, tx and rx leds, 14 digital input/output pins, Aref, and Arduino reset.

3.2 Fingerprint Module R307

In order to validate the authentic user, Fingerprint Module R307 has been employed. Fingerprint Module R307 consists of an optical fingerprint sensor, high-speed DSP processor, and high-performance fingerprint alignment algorithm. They also possess high-capacity FLASH chips, hardware and software composition, stable performance, simple structure with fingerprint entry, image processing, fingerprint matching, search and template storage and many other functions.

3.3 Servo motors

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

3.4 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is a very basic module that has 2 controllers with 16 Pins which is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi-segment LEDs as they are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations. The status of the system is displayed using LCD.

3.5 I2C back pack

IC/I2C Interface Adapter Module is used for 16×2 LCD Display. It uses the PCF8574T IC chip which converts I2C serial data to parallel data for the LCD display. This interface module simplifies connecting an Arduino to a 16×2 Liquid Crystal display using only 4 wires.

3.6 Micro switchs

Micro Switchs is a type of momentary contact switch used widely in automotive. The actuator of these switches often has a hinged wheel placed above a push button. In this system, Micro switchs with 3 buttons are used. The first button is used to capture the 3D image of the fingerprint for enrolment. The other two buttons are used for adding and deleting fingerprint stored in the database.

3.7 Software

The system starts functioning by receiving the fingerprint of an authorized person. When the fingerprint sensor receives the correct fingerprint pattern it allows the valve to open. The code to add and delete and store the fingerprint are written in C. Fingerprint recognition software library is loaded. The code for matching and the instructions to open the valve are also coded in C using the Arduino IDE

ARDUINO IDE

Arduino Integrated Development Environment - or Arduino Software (IDE) is a free, integrated toolset for the development programmed for an Arduino processor. The coding is done using Embedded C. Arduino Software (IDE) The contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. The pins are defined in the void setup(). In the void loop(), the codes to perform various actions on devices(ON/OFF) are written. These are controlled and monitored by the server.

3.8 Circuit diagram

The security system consists of Arduino Uno, a Fingerprint Sensor Module, LCD Display, Servo Motor and I2C
Backpack. The power supply is provided to all the units. The circuit diagram is represented in Figure 2.

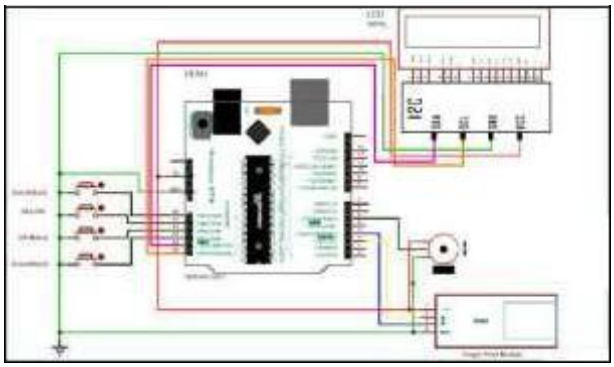

Fig. 2: Circuit diagram of the system

IV. CONCLUSION

This work is aimed at improving the level of security in automobiles. We have developed an embedded system that uses fingerprint biometric pattern, a low-cost yet effective method, for authorizing the user who can drive the vehicle. A valve fixed in the outlet of a fuel tank allows fuel to flow only if the user is authenticated. For this system to work, an additional valve has to be attached to the fuel tank of the engine during manufacturing. Such customized vehicles with security system will help in reducing theft of a vehicle.

REFERENCES

[1] Upendran Rajendran and Albert Joe Francis,"Anti Theft Control System Design Using Embedded System", Proc. IEEE, Vol. 85, Page no. 239- 242, 2011.
[2] Vikram Kulkarni and G. Narsimhulu, "A Low-cost Extended Embedded Smart Car Security System on Face Detection and Continuous Video Monitoring System", Int. Journal of Engineering Science and Advanced Technology (IJESAT), 2012.
[3] M.Sunitha, V.Vinay Kumar, and G. Raghu, "Embedded Car Security System", Int. Journal of Engineering Development and Research (IJEDR), 2012.
[4] Mohammad A. Al-Khedher and Sharaf A. Al-Kheder, "Intelligent Anti-Theft and Tracking System for Automobiles", Int. Journal of Machine Learning and Computing, 2012.
[5] Sukeerti Singh and Ayushi Mhalan, "Vehicle Theft Alert System using GSM", Int. Journal of Engineering Science and Technology (IJEST), 2013.
[6] Mudit Singhal and Sudeep Singh, "An Embedded Interface for GSM Based Car Security System", Int. Conference on Computational Intelligence, Communication Systems, and Networks, IEEE Computer Society, 2012.
[7] N. Kiruthiga , L. latha, S. Thangasamy, "Real Time Biometrics based Vehicle Security System with GPS and GSM Technology", Procedia Computer Science 47 471 – 479, 2015.
[8] Bhumi Bhatt, "Smart Vehicle Security System Using GSM & GPS" International Journal of Engineering and Computer Science Vol. 4 Issue 6, 2015.
[9] A. Karthikeyan "FINGERPRINT BASED IGNITION SYSTEM" International Journal of Computational Engineering Research, 2250–3005. Vol. 2 Issue No.2 Pages 236-243, 2012.
[10] Roopam Arora "START-UP THE ENGINE USING FINGERPRINTING" International Journal of Computer Engineering and Applications, Volume IX, Issue X, 2015.
[11] Kaisheng Zhang, "Study on the Embedded Fingerprint Image Recognition System, Int. Conference of Information Science and Management Engineering", 2010.
[12] Z. Brijet, B. Santhoshkumar, and N. Bharathi "Vehicle Anti-theft System Using Fingerprint Recognition Technique", Journal of Chemical and Pharmaceutical Sciences Issue 9: Page no. 78, 2016.

