

Innovative Automobile Security System using Various Security Modules

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Abstract- This dissertation project presents Design & Development of Innovative Automobile security system to control the theft of a vehicle using GSM, GPS and Fingerprint module through ARM Cortex microcontroller. The main objective of this is to offer an advanced security system in multiple levels to protect the car from unauthorized access using GSM, GPS & RFID technology. It provides a protected password to unlock the car and real time biometric user authentication in second level to start the ignition after finger print verification is done. If the fingerprint not match with that in database, P89v51rd2fn produces the interrupt signal to disable the engine and initiates an alarm and also inform the car owner about the unauthorized access via short Message Services (SMS) based.

Keywords - Security, Automobile, Modules, ARM Cortex, GSM, GPS.

I. INTRODUCTION

Nowadays, automobile thefts are increasing at an alarming rate all over the world. Hence to prevent vehicles from being stolen, most of the vehicle owners have started using the theft protection systems. Presently available anti-theft systems are very costly. Hence an attempt is made to develop a system, based on P89v51rd2fn microcontroller using GSM technology. The system developed is a simple and economical in providing high security to vehicles. This various level anti-theft security system makes use of RF transceiver with protected password in the first level to unlock the car. In the second level finger print authentication is incorporated to start the car engine. In case unauthorized person is trying to access to the car, then the system disables the engine and sends a text message to the vehicle owner and simultaneously an alarm is initiates to alert the neighborhood areas. In case the owner wanted to permit a known person to have access to his car, then an SMS is sent to the system from the car owners mobile to activate the car engine system at the third level of security.

The 4 C's of a Good Summary:-Conciseness: as short as possible. Coverage: covers main key points. Context: defines terms before using them Coherence: flows naturally and fluidly.

Embedded systems are where the software meets the physical areas of world. As we put little computers into all sorts of systems (door locks, airplanes, pacemakers), how we implement the software is truly, terrifyingly important. Embedded systems design is a productive synergy between hardware and software. Essentially, it is the art of designing the proper combination of hardware and software components to achieve design goals such as speed and efficiency. Although we might not realize these, most of us use these embedded systems continuously within our daily lives.

Placing an microprocessor system into a product makes the product essentially smart. It can then be programmed to do things that are too difficult or expensive using conventional technologies such as logic, or time switches. Link such a smart product to the Internet and also it can do even better. As example, products can be programmed to do self-diagnostic checks and to report back to the manufacturer. Not only this provide the potential to collect data that can be use to improve products, it can be allow for the manufacturer to inform the user of potentially problems, so that action to be taken. This opens up possibilities for improved service. Basically, microprocessors enable firms to compete on product and service innovation, by adding products and service features customers value, but which would be not possible without this new technology.

II. SYSTEM MODEL

This system provides multiple levels of security to protects the vehicle from unauthorized access .The first level of security is to unlock the car doors, a secret Password is

required from the user. User can type this password from his/her car key which contains RF(Radio Frequency) transmitter along with four digit keypad. RF receiver is placing inside the car and interfaced with the microcontroller. It is used to receive the message string from RF transmitter. Then the system compares the entered RF string password with the existing or already defined by owner. If entered password is correct then the system goes to next security level. Otherwise, a text message is sent to the owner that "password entered at level 1 is not valid.

Before going to start the engine user has to go in the second level of security i.e. fingerprint/biometrics verification of the owner. Finger print sensor is used for enroll and verify the fingerprints. In case it matches with the already stored fingerprints, then user has to insert their key to start the car engine. Otherwise a text message is sent to the owner that "finger print verification at level2 is unauthorized" and at the same time alarm is enable and one message is sent to the owners number via GSM.

In case if a known person to owner whose fingerprint is not stored in memory want to use the car, then the person has to go through the third level of security. In which owner gives permission to access the vehicle by sending a text message to the system to enable the engine.

III. SYSTEM ARCHITECTURE

The system comprises of a ARM CORTEX & P89v51rd2fn microcontrollers which are the brain and control circuit behind the entire design,

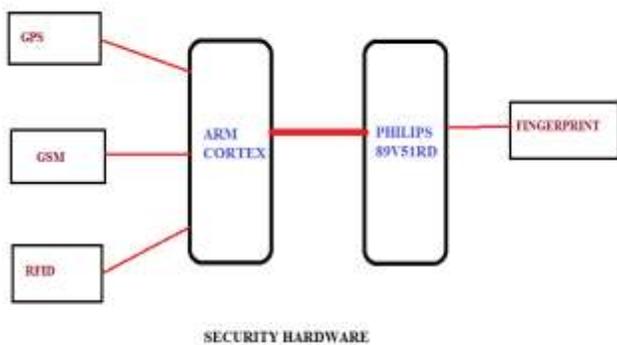


Fig 3.1: Functional block diagram of security system

ARM CORTEX:

ARM is a family of instruction set for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings.

A RISC-based computer design approach means ARM processors require significantly few transistors than typical CISC processors in many computers. This approach reduces costs, heat and power use. Such reductions are desirable for light, portable, battery-powered devices—including devices like smartphones, laptops and other embedded systems. A simpler design facilitates most efficient for higher core counts at lower cost, providing good energy efficiency for servers. ARMv7, is the most widely used in mobile devices and tablets.



Fig. 3.2 Cortex M0

ARMv7, that defines the architecture for the first of the Cortex series of cores, defines three architecture "profiles":

A-profile, the "Application" profile: Cortex-A series

R-profile, the "Real-time" profile: Cortex-R series

M-profile, the "Microcontroller" profile: Cortex-M series

Architecture profiles were defined for ARMv7, ARM subsequently also defined the ARMv6-M architecture (used by the Cortex M0/M0+/M1) as a subset of the ARMv7-M profile with fewer instructions

RF module:

RF module is ideal for remote control applications within some specified distance. The transmitter operates from 1.5-12V power supply, making it ideal for battery-powered applications, where low cost and long range is essential. The RF receiver module require not any external RF components except for the antenna. It generates virtually no emissions, and it can be used for higher volume applications.

Fingerprint Module:

It adopts optic fingerprint sensor, which consist higher-performance Digital Signal Processing and Flash. Fingerprint Sensor Module is able to conduct fingerprint image

processing. It is used to perform fingerprint verification for better security to Automobile security system.

Proximity Sensor:

This proximity sensor, which is able to detect the presence of metal objects that in the range of their oscillating field and provide detection of target. When the key is inserted in the key hole the inductive proximity sensor detects the key and sends signal to the microcontroller, after which engine system is start.

GSM Module:

GSM is Global System for Mobile communications. It is the most popular form in telephony communication, and it is nowadays available in all locations in entire world. GSM provides users to make use of their phones for mobile communications. The popularity of GSM is known from the number of user's i.e. over 2 billion people all across the world use GSM technology. It provides high quality signals and speech channels, as make them access to high quality digital communication at very appropriate rates. Their customers with cheap calling and text messaging options by GSM network operators.

Relay:

A relay is an electrically operated switch and it isolates one electrical circuit from another. In its simple form, a relay consists of a coil used as an electromagnet to open and close switches contacts in relay. It is used to switch a device which draws more current than is provided by an output of a switch or component.

DC motor:

A DC motor consists of a rotor and a permanent magnetic field stator. Which is maintain by using permanent magnets or electromagnetic windings.

IV. DESIGN LAYOUT OF SECURITY SYSTEM



Fig. 4.1 Security Methods

Hardware Design:

In this section we are connecting microcontroller with entire security system modules.



Fig. 4.2 Hardware with interfacing two ARM processor as shown

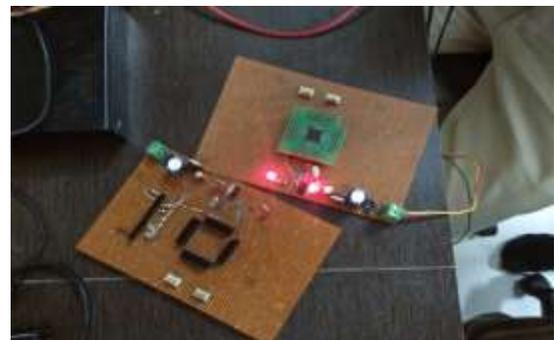


Fig. 4.3 Interfacing two ARM processor

The system consists of RF transmitter, which contains switches, through which user enters the secret password .This entered password is then received by RF receiver. RF transmitter is powered by battery and is placed on car key of the owner.

V. RESULTS

In this paper we present an anti theft security system for cars using GSM that tries to protect the vehicle from theft by means of multiple levels of security system.

Level 1:

To unlock the car, a secret password is required from the user. If the entered password is correct as stored then the system goes to next security level otherwise, a text message is sent to the owner that “password entered at level 1 is unauthorized” shown in figure 5.



Fig. 5.1 Level 1 Authentication

Level 2:

At second level biometrics finger print verification of owner is done. In case it matches with the stored fingerprints, then “please enter key” is displayed, so that user can start the engine of car.



Fig. 5.2 Level 2 Authentication

Otherwise a text message is sent to the owner about “finger print authentication at level2 is unauthorized” as shown in figure 5, and at the same time alarm is start. In case if a known person to owner wants to use the car, then the person has to undergo the third level of security. In level 3 owner grants access by sending text to the system. When an authorized person want to access the car, then the security system sends a text message to the owner mobile in first level and second level.



Fig. 5.3 Alert Messages to the Mobile at Level 1 & 2

Level 3:

At third level of security, access to the vehicle is provided to the person who is known to owner and whose fingerprint is

not stored in memory by just sending a secret text message to the system. After which the access to car is provide to that known person.



Fig. 5.1 Level 3 Authentication

VI. CONCLUSION AND FUTURE WORK

Where there is higher level of theft, there is need for very good security system for automobiles. This paper provides an appropriate method of designing and assembling a low cost and essential theft control system for automobile using GSM, RF modules and biometrics implemented on ARM7 & p89v51rd2fn microcontrollers. This system provides reliable security for cars. By installing this system in cars an unknown person cannot start the engine of car. In future, Cameras can be incorporated into the system to identify the person and also GPS system can be added to keep the track of the vehicle that is being stolen.

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