A High Anti-Theft Protection for Vehicle Using Embedded Controller, Finger Print, GSM and GPS

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Abstract:

Recently vehicle tracking system is getting vast popularity because of the rising number of the stolen vehicles. Vehicle theft is happening on parking and sometimes driving in unsecured places. This research work explores how to avoid this kind of stealing and provides more security to the vehicles. The implemented system contains single-board embedded system which is equipped with global system for mobile (GSM) and global positioning system (GPS) along with a microcontroller installed in the vehicle. The use of GSM and GPS technologies allows the system to track the object and provides the most up-to-date information about on-going trips. Moreover, fingerprint verification is done in the implemented system to ensure the driving of correct person. The implemented system is very simple with greater security for vehicle anti-theft protection and low cost technique compared to others.

Keywords

GMS; GPS; fingerprint; embedded system; vehicle anti-theft protection.

1. Introduction

A vehicle tracking system combines the installation of an electronic device in a vehicle or fleet of vehicle to enable the owner or third party to track the vehicle's location and collecting data in the process. Modern Vehicle Tracking system (VTS) is the technology used to determine the location of a vehicle using different methods like GSM and GPS module and other radio navigation systems operating through satellites and ground based stations .GSM and GPS based vehicle location and tracking system provides effective, real time mapping based vehicle location tracking. The system uses geographic position and time information from the Global

Positioning Satellites. After emerging of GPS system developed by The United States government, first it was only for military purpose. After opening for public, it has been used widely. Al-Bayari and Sadoun discussed in details Automatic Vehicle

Location (AVL) system that works under GIS environment. A complete FPGA implementation of the vehicle position tracking system using short message services (SMS) was reported by Hap sari. The design and implementation of a mobile object management system that makes use of the existing GSM networks and its extension GPRS for data communication was discussed by Xiaobo Fan et al. Hsiao location update strategy with the objective of minimum total cost. Tamil et al. did similar works. Video surveillance and tracking of moving civilian vehicle done by Nishi Kanta.

Pati added new dimension to the development of the tracking systems. In this research work, a system has been developed based on microcontroller that consists of a GPS and GSM. A two way communication process is achieved using a GSM modem. This study also comprises of a bio-metric protection system of the vehicle and fingerprint verification of the driver of the vehicle is used to protect the vehicle from anti-theft. Fingerprint recognition or fingerprint authentication can be defined as a method of verifying a match between two human fingerprints in an automated behaviour. Fingerprints are one of many forms of biometrics used to identify individuals and verify their identity. It is known that every person has a unique fingerprint image. When driver gives his verified fingerprint image before starting the vehicle, the system will be considered as fair condition. But when vehicle's location is changed without fingerprint verification, the system will be taken as abnormal condition. Then the system will send an SMS to owner of the vehicle with an URL of 'GOOGLE MAP' having the coordinate of the current location of the vehicle. SMS will be then sent to the owner having updated location's co-ordinate very interval of 10 seconds until doing the proper fingerprint verification. Moreover, vehicle's owner can get the vehicles location at any time by SMS after making a 'missed call'
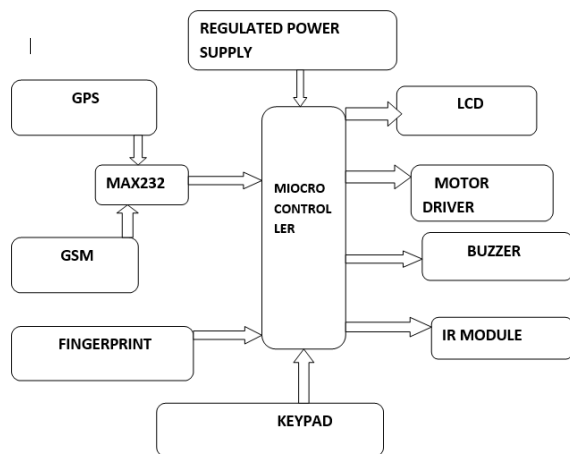
2. Project Design

Fig1: Block diagram of Hardware

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega microcontroller — essentially a complete computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip. Unlike, say, a Raspberry Pi, it's designed to attach all kinds of sensors, LEDs, small motors and speakers, servos, etc. directly to these pins, which can read in or output digital or analog voltages between 0 and 5 volts. The Arduino connects to your computer via USB, where you program it in a simple language (C/C++, similar to Java) from inside the free Arduino IDE by uploading your compiled code to the board. Once programmed, the Arduino can run with the USB link back to your computer, or stand-alone without it — no keyboard or screen needed, just power.

In order to maximize performance and parallelism, the AVR uses a Harvard architecture – with separate memories and buses for program and data. Instructions in the program memory are executed with a single level pipelining. While one instruction is being executed, the next instruction is pre-fetched from the program memory. This concept enables instructions to be executed in every clock cycle. The program memory is In-System Reprogrammable Flash memory. The fast-access Register File contains 32 x 8-bit general purpose working registers with a single clock cycle access time. This allows single-cycle Arithmetic Logic Unit (ALU) operation. In a typical ALU operation, two operands are output from the Register File, the operation is executed, and the result is stored back in the Register File– in one clock cycle.

Six of the 32 registers can be used as three 16-bit indirect address register pointers for Data Space addressing – enabling efficient address calculations. One of these address pointers can also be used as an address pointer for look up tables in Flash program memory. These added function registers are the 16-bit X-, Y-, and Z-register, described later in this section. The ALU supports arithmetic and logic operations between registers or between a constant and a register. Single register operations can also be executed in the ALU. After an arithmetic operation, the Status Register is updated to reflect information about the result of the operation. Program flow is provided by conditional and unconditional jump and call instructions, able to directly address the whole address space. Most AVR instructions have a single 16-bit word format. Every program memory address contains a 16- or 32-bit instruction.

The Global Positioning System (GPS) is the only fully functional Global Navigation Satellite System (GNSS). The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals, which enable GPS receivers to determine their location, speed,. GPS was developed by the United States Department of Defense. Its official name is NAVSTAR-GPS. Although NAVSTAR-GPS is not an acronym, a few backronyms have been created for it. The GPS satellite constellation is managed by the United States Air Force 50th Space Wing.

Global Positioning System is an earth-orbiting-satellite based system that provides signals available anywhere on or above the earth, twenty-four hours a day, which can be used to determine precise time and the position of a GPS receiver in three dimensions. GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field. Precise positioning is possible using GPS receivers at reference locations providing corrections and relative positioning data for remote receivers. Time and frequency dissemination, based on the precise clocks on board the SVs and controlled by the monitor stations, is another, use for GPS. Astronomical observatories telecommunications facilities and laboratory standards can be set to precise time signals or controlled to accurate frequencies by special purpose GPS receivers.

Similar satellite navigation systems include the Russian GLONASS (incomplete as of 2008), the upcoming European Galileo positioning system, the proposed COMPASS navigation system of China, and IRNSS of India.

Following the shooting down of Korean Air Lines Flight 007 in 1983, President Ronald Reagan issued a directive making the system available free for civilian use as a common good. Since then, GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, scientific uses, and hobbies

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such as geocaching. GPS also provides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications networks.

According ancient Greek scripts BIOMETRICS means study of life. Biometrics studies commonly include fingerprint, face, iris, voice, signature, and hand geometry recognition and verification. Many other modalities are in various stages of development and assessment. Among these available biometric traits Finger Print proves to be one of the best traits providing good mismatch ratio and also reliable. Registering the attendances of students have became a hectic work as sometimes their attendance may be registered or missed. To overcome this problem i.e. to get the attendances registered perfectly we are taking the help of two different technologies viz. EMBEDDED SYSTEMS and BIOMETRICS.

Firstly discussing about Biometrics we are concentrating on Fingerprint scanning. For this we are using FIM 3030N high voltage module as a scanner. This module has in-built ROM, DSP and RAM. In this we can store up to 100 users fingerprints. This module can operate in 2 modes they are Master mode and User mode. We will be using Master mode to register the fingerprints which will be stored in the ROM present on the scanner with a unique id.

When this module is interfaced to the microcontroller, we will be using it in user mode. In this mode we will be verifying the scanned images with the stored images. When coming to our application the images of the students will be stored in the module with a unique id. To register their attendance the students have to scan their image which is then verified with the image present in fingerprint module and their attendance is registered for that day.

This scanner is interfaced to 8051 microcontroller through max232 enabling serial communication. By using this controller we will be controlling the scanning process. After the scanning has been completed the result is stored in the microcontroller. By simply pressing a switch we can get the list of absentees for that day.

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

This project is implemented using following software's:
• Express PCB – for designing circuit
• ARDUINO C compiler - for compilation part

• Proteus 7 (Embedded C) – for simulation part.

Express PCB:

Breadboards are great for prototyping equipment as it allows great flexibility to modify a design when needed; however the final product of a project, ideally should have a neat PCB, few cables, and survive a shake test. Not only is a proper PCB neater but it is also more durable as there are no cables which can yank loose.

Express PCB is a software tool to design PCBs specifically for manufacture by the company Express PCB (no other PCB maker accepts Express PCB files). It is very easy to use, but it does have several limitations.

It can be likened to more of a toy then a professional CAD program.

It has a poor part library (which we can work around)

It cannot import or export files in different formats

It cannot be used to make prepare boards for DIY production

Express PCB has been used to design many PCBs (some layered and with surface-mount parts. Print out PCB patterns and use the toner transfer method with an Etch Resistant Pen to make boards. However, Express PCB does not have a nice print layout. Here is the procedure to design in Express PCB and clean up the patterns so they print nicely.

Proteus is software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller and this is done by the Proteus. Proteus is a programmer which itself contains a microcontroller in it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the pic compiler and dumps this hex file into the microcontroller which is to be programmed. As the Proteus programmer requires power supply to be operated, this power supply is given from the power supply circuit designed and connected to the microcontroller in proteus. The program which is to be dumped in to the microcontroller is edited in proteus and is compiled and executed to check any errors and hence after the successful compilation of the program the program is dumped in to the microcontroller using a dumper.

3. Results and Discussions

The Project schematic diagram of ''A HIGH ANTI THEFT PROTECTION FOR VEHICLE USING EMBEDDED CONTROLLER, FINGER PRINT, GSM AND GPS''
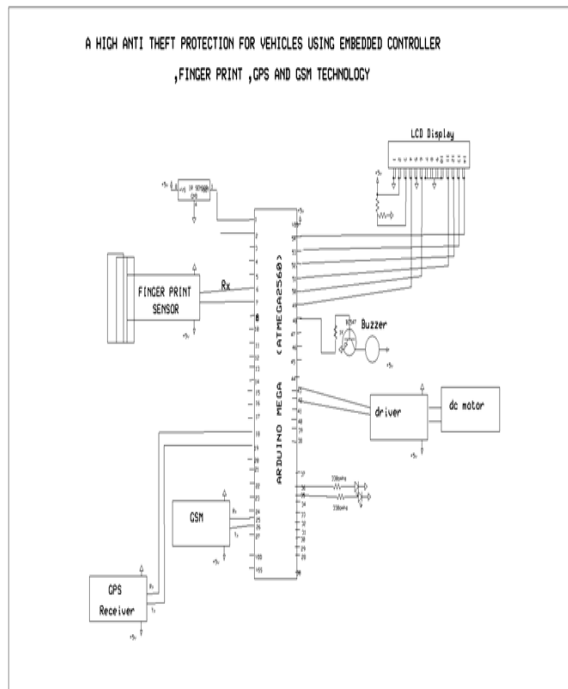
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Fig 2: Schematic Diagram of Proposed Design

4. Conclusion

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

5. Future Scope

In this research work, vehicle location can be tracked and prevention of it from theft with fingerprint verification is done with minimum cost in quasi real-time mode. Fingerprint technology is very effective security check technology and also in lower cost to avoid stealing of vehicles. In future, smartphone (i.e. android, windows) application can be made and interfacing a dedicated smart-phone installed in vehicle with fingerprint device can be done to get real-time vehicle tracking with inter-active mapping.

This project can be extended by adding multiple sensors and wireless communication system. So that we can directly connect different vehicles based fingerprint and also we can send same modules to multiple receivers and overcome vehicle thefts .By adding these things this project can be used in automobile system.

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