

Safeguarding of Automobiles Using Enhanced GSM-GPS Based System

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Abstract- Now-a-days all the automotives are equipped with auto cop systems. Even though, the thieves are breaking the barriers and stealing the vehicles. This project is the right solution for this problem. Using this project, one can control his/her vehicle's car engine by means of an SMS. This Project presents an automotive localization system using GPS and GSM-SMS services. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. This system is also provided with emergency switch which can be turned off through an SMS. This switch takes the responsibility to turns OFF the engine and can be turned ON only after receiving a predefined password from the owner of the vehicle. Here the system is also interconnected with the car alarm system and alerts the owner on his mobile phone.

Index Terms: ARM7; LCD; GPS; GSM-SMS; Relay; Accident sensor switch; Buzzer

I. INTRODUCTION

This tracking system is composed of a GPS receiver, ARM-7 LPC2148 Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The ARM-7 LPC2148 Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. ARM-7 LPC2148 Microcontroller also gets the speed of the vehicle and sends it to user/owner.

The presented application is a low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The proposed solution can be used in other types of application, where the

information needed is requested rarely and at irregular period of time (when requested). This system is also can be interfaced with Vehicle airbag system. This enable it to monitor the accident situations and it can immediately alerts the police/ambulance service with the location of accident.

In case of vehicle theft situations the owner can know the vehicles current location and based on that he can stop the vehicle by sending a predefined SMS message to this system. After receiving SMS message from owner this system automatically stops the ignition system hence the vehicle will not function any more.



Fig 1. Representation of System

Hence accident notification and vehicle theft are the two main issues that drove me towards implementing this project as saving lives and property of the public is a courtesy.

The major block diagram of the project is depicted below which comprises the primary modules that are used to drive the project.

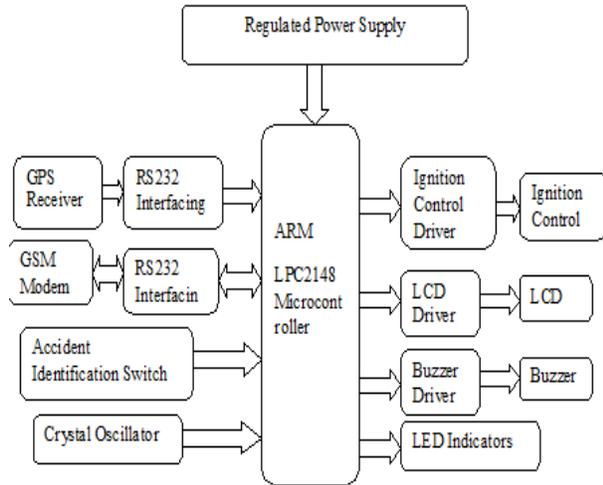


Fig 2. Block Diagram of the project

II. HARDWARE ARCHITECTURE

A. Global System For Mobile

Global System for Mobile (GSM) is a second generation cellular standard developed to cater voice services and data delivery using digital modulation. Cellular is one of the fastest growing and most demanding telecommunications applications. Cellular systems using a digital technology will become the universal method of tele-communications.

Global System for Mobile Communication (GSM) is a standard for digital communication. GSM uses the Time Division Multiple Access (TDMA). The concept of cellular service is the use of low power transmitters where frequencies can be reused within a geographic area.

Commands for Message formats:

GSM 900 supports two messaging formats- Text mode and PDU mode

I. List of commands for messaging format

SL. NO	AT CMND	DESCRIP TION	EXAMPLE
1	AT+CMGF	For selecting message format	AT+CMGF=1(Text Mode) 0(PDU Mode)
2	AT+CMGR	For reading message	AT+CMGR=1 (reads currently received message)
3	AT+CMGS	For sending message	AT+CMGS="90306 XXXXX"
4	AT+CMGD	To delete message	AT+CMGD= location of message

B. Global Positioning System

GPS is used in vehicles for both tracking and navigation. Tracking systems enable a base station to keep track of the vehicles without the intervention of the driver, whereas navigation system helps the driver to reach the destination. Whether navigation system or tracking system, the architecture is more or less similar. When an accident occurred in any place then GPS system tracks the position of the vehicle and sends the information to the particular person through GSM by alerting the person through SMS or by a call.

Accuracy of GPS:

There are four basic levels of accuracy - or types of solutions - we can obtain with our real-time GPS mining system:

II. Types of GPS with accuracy

SL. NO	GPS Type	Level of Accuracy
1	Autonomous	15 - 100 meters
2	Differential GPS (DGPS)	0.5 - 5 meters
3	Real-Time Kinematic Float (RTK Float)	20cm - 1 meter
4	Real-Time Kinematic Fixed (RTK Fixed)	1cm - 5 cm

C. ARM7LPC2148

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT, PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

D. LCD Screen:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or

two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

III. SOFTWARE REQUIREMENTS

A. Keil Software:

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

B. Flash Magic Software

Dumping of Hex File into MCU of Board

The method to download Hex File into Flash Memory of MCU in Board is to use Program Flash Magic that is connected with MCU through Serial Port of computer PC. This program can be downloaded free without any charge from website <http://www.flashmagictool.com/>

IV. PROJECT DESCRIPTION

The vehicular system includes an ARM 7 LPC2148 microcontroller, GPS module, GSM module, Relay, 16x2 LCD display, Accident sensor. The whole system works on a 12v DC regulated power supply. The GPS receiver module interfaced with UART0 of ARM controller provides location information of vehicle in the form of Latitude and Longitude. This information is shown on LCD that is interfaced with GPIO0, this information is given to a concern person by GSM module wirelessly that is interfaced with UART1 of ARM controller. The module need to be inserted a GSM SIM (Subscriber Identity Module) card into it. Here an Accident switch is interfaced with GPIO of ARM, whenever an accident occurs, that switch gets pressed and intimates the concerned about the location of accident through GSM module.

Apart from this an Electromagnetic Relay is interfaced to GPIO of ARM which is used to control the ignition system of vehicle in case of theft conditions. A buzzer is also included with GPIO of ARM to alert the surrounding atmosphere in theft cases.

III. Representation of communication between user and vehicle.

SL. NO	SMS from user	Reply from MCU
1	wru	Vehicle located at : latitude: 17.426940 longitude: 78.447405
2	alarmon	Vehicle alarm turned ON
3	alarmoff	Vehicle alarm turned OFF
4	lock	Vehicle engine switched off at : latitude: 17.426940 longitude: 78.447405
5	unlock	Vehicle ignition system turned ON
6	Emergency situation(real time)	Accident alert at : latitude: 17.426940 longitude: 78.447405

V. PROJECT IMLEMENTATION

Here we use ARM 7 LPC2148 microcontroller. It mainly controls the entire functioning of the project. It gets the information from the GPS modem and passed it to the GSM modem. It controls the ignition sensor and accident sensor.

GSM modem is used to send messages to the predefined numbers stored in the microcontroller. This GSM modem uses AT commands in order to send messages to the predefined number.

Apart from knowing position of the vehicle this project also provides theft control. Here we are using an Electromagnetic Relay which locks the ignition mechanism of the vehicle by sending SMS such as “lock” i.e., the relay opens ignition system’s electrical connection so that the vehicle can be stopped. To turn on the ignition system send “unlock”. Meanwhile owner can know the status of the vehicle in form of SMS from the controller.

We are also providing alarm system using a Buzzer. Suppose in case of vehicle theft user can send SMS like “alarmon”, then alarm can be turned ON. Later on the alarm can be turned off by sending “alarmoff”.

Accident Notification is carried out by an Accident switch. Press and holding of accident switch indicates the occurrence of accident and sends SMS “vehicle got crashed at latitude: xxxx longitude: xxxx to the user.

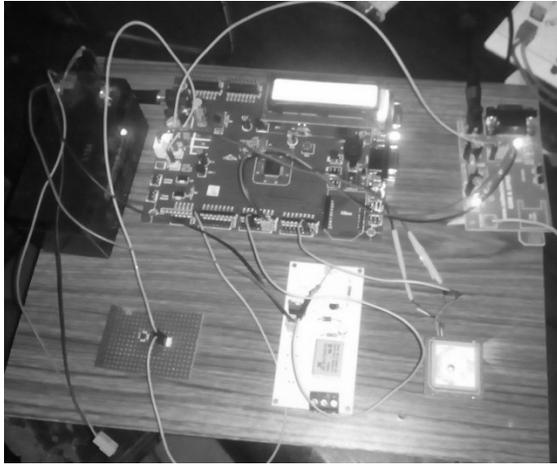
VI. CONCLUSION

This project presents vehicle accident detection and alert system with SMS to the user defined mobile numbers. The GPS tracking and GSM alert based algorithm is designed and implemented with LPC2148 Microcontroller in embedded system domain. The proposed Vehicle accident detection system can track geographical information automatically and sends an alert SMS on accident condition. Apart from accident alert , the car engine is locked if any unauthorized access is achieved.

Integrating the features of all hardware components with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

VII. RESULT

The result of the project can be viewed using the following interfaced.



VIII. FUTURE PROSPECTS

This project can efficiently find the location and the position of the vehicle and can transmit this information to the owner on his mobile phone as a short message (SMS) at his request using GPS and GSM modems and also alerts when there is an accident occurred.

Moreover the project can be extended through Vehicle real-time monitoring by sending “its” information regarding velocity, Position (longitude, latitude) to the monitoring station and to the user/owners mobile by using GPRS. By interfacing MMC/SD card to the system we can log the path of the vehicle being travelled. A USB Camera interfaced can be used to monitor the atmosphere inside any vehicle in order to avoid any sort of molestations.

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