

VEHICLE TRACKING AND ACCIDENT IDENTIFICATION SYSTEM

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Abstract: In this paper, an intention to develop VEHICLE TRACKING AND ACCIDENT IDENTIFICATION SYSTEM. This system has been developed and implemented using the Vibration sensors and LPC2148 controller based mobile technology. If the accident occurred then this system immediately transmit the location of the accident to the emergency care centre phone number through Short Message Service (SMS). According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to registered mobile number. So that person can immediately trace the location through the GPS MODEM, after receiving the information. Then after conforming the location necessary action will be taken. This paper is useful in detecting the accident precisely by means of vibration sensor.

Index Terms: *Vibration sensors, ARM 7 LPC2148, GSM MODEM, GPS MODEM.*

1. Introduction

In the last few decades, India has progressed at such an enormous rate that many companies have strongly established themselves here. These companies bring a huge amount of workforce with them. Arranging transportation to such a huge mass is a cumbersome task involving many intricacies. The development of satellite communication technology is easy to identify the vehicle locations. Vehicle tracking systems have brought this technology to the day-to-day life of the common person. Today GPS used in cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. All the existing technology support tracking the vehicle place and status.

The GPS/GSM Based System is one of the most important systems, which integrate both GSM and GPS technologies. It is necessary due to the many of applications of both GSM and GPS systems and the wide usage of them by millions of people throughout the world. Road accidents constitute the major part of the accident deaths all over the world. According to the Insurance Institute for Highway Safety (IIHS), new cars and its high-tech safety features have helped to lessen auto related deaths over the past 12 years. Though it credits technology for lessening auto accidents, yet the IIHS cannot help accusing bad driving behaviours like drunken driving, speeding and not using seatbelts for still causing major traffic deaths. Automatic vehicle accident detection and messaging system is an embedded intelligence implanted into the auto-mobile.

The purpose of the project is to find the vehicle where it is locate the vehicle by means of sending a message using a system which is placed inside of vehicle system. To know where the accident happened through location tracking and sending a message to your related one or to the emergency services by using GSM and GPS system. So in this work we are using the ARM7 LPC2148 microcontroller. Here we used to better accuracy and GPS and GSM modules which helps to trace the vehicle anywhere on the globe. The exact location of the vehicle is sent to our remote devices (mobile phones) using GSM modem.

2. Related Work:

Our paper describes about the VEHICLE TRACKING AND ACCIDENT IDENTIFICATION SYSTEM using GPS and GSM technologies. We are using ARM7 (LPC2148) microcontroller in our project. When the system is switched on, LED will be ON indicating that power is supplied to the circuit. When the Vibration sensors that we are using in our project sense any obstacle, they send interrupt to microcontroller. The GPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through a message. This message will be received using GSM modem present in the circuit. The message will give the information of longitude and latitude values. Using these values the position of the vehicle can be estimated.

The general mechanism is to provide the real time geographical position of a vehicle using GPS receiver and send this information to GSM center through configurable software, this is all done by the monitoring center which is working as a control unit that is connected not only by an optical cable but also connected wirelessly through TCP/IP protocols. A different approach is proposed by integrating GPS and GSM/GPRS transmission technologies. The basic idea is to localize the vehicle system by receiving the real time position of the vehicle through GPS and send the information through GSM module via SMS service with an added feature of GPRS transmission to the monitoring center through usage of internet.

3. GPS Module

The Global Positioning System (GPS) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.^[1] The system provides critical capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

The US began the GPS project in 1973 to overcome the limitations of previous navigation systems, integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. The U.S. Department of Defense (DoD) developed the system, which originally used 24 satellites. It became fully operational in 1995. Bradford Parkinson, Roger L. Easton, and Ivan A. Getting are credited with inventing it.

How it works

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

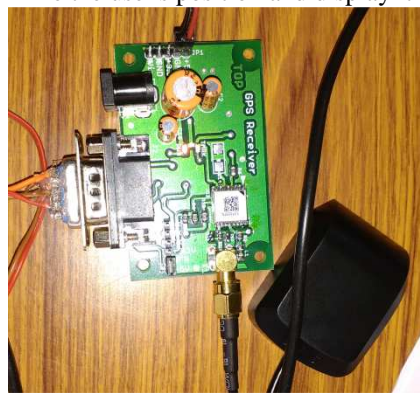


Fig-1:GPS Module

Applications:

1. AGRICULTURE
2. MILITARY
3. MARITIME
4. AUTOMOTIVE
5. SURVEYING
6. AVIATION
7. FORESTRY
8. ENVIRONMENTAL
9. PUBLIC SAFETY
10. Mapping Software

4. GSM MODEM

GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL –Modems SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with 5V Microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be configurable from 9600- 115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable User to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface.

Features:

- Quad Band GSM/GPRS : 850 / 900 / 1800 / 1900 MHz
- Built in RS232 to TTL or viceversa Logic Converter (MAX232)
- Configurable Baud Rate
- SMA (SubMiniature version A) connector with GSM L Type Antenna
- Built in SIM (Subscriber Identity Module) Card holder
- Built in Network Status LED
- Inbuilt Powerful TCP / IP (Transfer Control Protocol / Internet Protocol) stack for

- Internet data transfer through GPRS (General Packet Radio Service)
- Audio Interface Connectors (Audio in and Audio out)
- Most Status and Controlling pins are available
- Normal Operation Temperature : -20 °C to +55 °C
- Input Voltage : 5V to 12V DC
- LDB9 connector (Serial Port) provided for easy interfacing

Hardware Description:

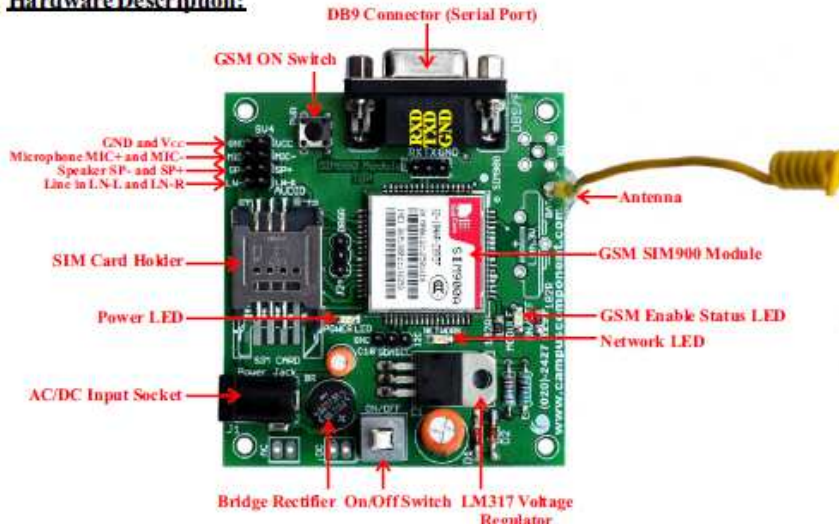


Fig-2: GSM Modem

5. ARM7 (LPC2148) Microcontroller

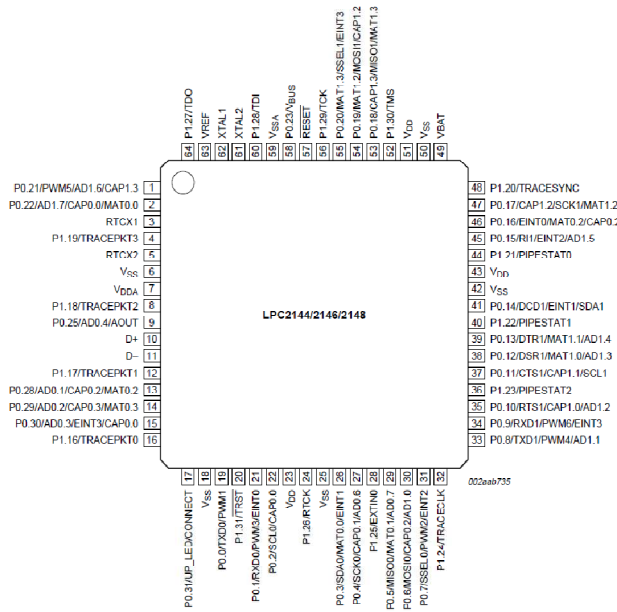


Fig-3: pin discription of LPC2148

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power.

Applications of ARM Processor

- Industrial control
- Medical systems
- Access control
- Point-of-sale
- Communication gateway
- Embedded soft modem
- General purpose applications

Features of ARM

- 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1 ms.

Vibration Sensors

Critical to vibration monitoring and analysis is the machine mounted sensor. Three parameters representing motion detected by vibration monitors are displacement, velocity, and acceleration. These parameters are mathematically related and can be derived from a variety of motion sensors. Selection of a sensor proportional to displacement, velocity or acceleration depends on the frequencies of interest and the signal levels involved.

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Fig-4: Vibration Sensor

LIQUID CRYSTAL DISPLAY(LCD)

To display interactive messages we are using LCD Module. We examine an intelligent LCD display of two lines, 16 characters per line that is interfaced to the controllers. The protocol (handshaking) for the display is as shown. Whereas D0 to D7th bit is the Data lines, RS, RW and EN pins are the control pins and remaining pins are +5V, -5V and GND to provide supply. Where RS is the Register Select, RW is the Read Write and EN is the Enable pin.



Fig-5: 16x2 LCD

Power Supply

Power Supply is the device that transfers electric power from a source to a load using electronic circuits. Power supplies are used in many industrial and aerospace applications and also in consumer products. Some of the requirements of power supplies are small size, lightweight, low cost, and high power conversion efficiency. In addition to these, some power supplies require the following: electrical isolation between the source and load, low harmonic distortion for the input and output waveforms, and high power factor (PF) if the source is ac voltage. Some special power supplies require controlled direction of power flow. Typical application of power supplies is to convert utility's AC input power to a regulated voltage(s) required for electronic equipment. Depending on the mode of operation of power semiconductors power supply can be linear or switching.

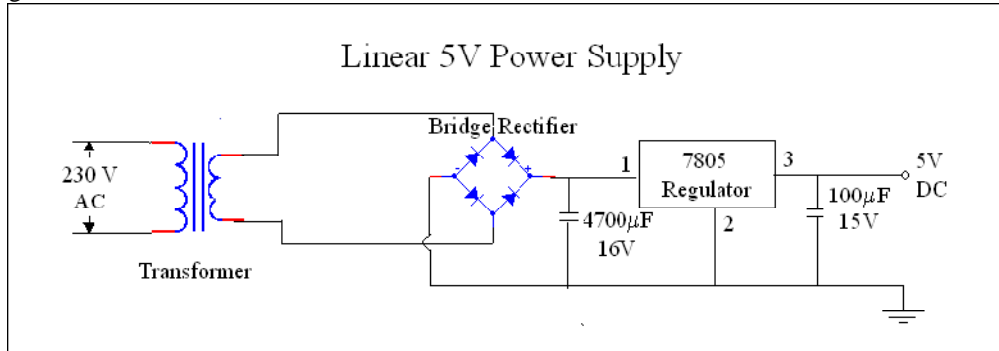


Fig-6: Circuit Diagram for 5V power Supply

Regulator

Voltage regulators ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection').

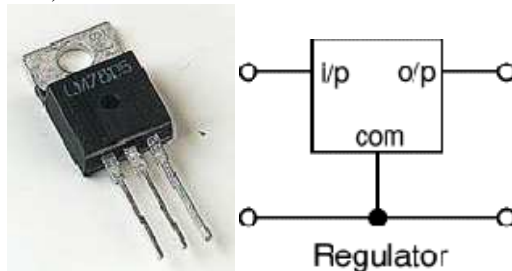


Fig-7: Regulator

6. OPERATION AND RESULT

First we can connect devices properly. Combine ARM processor, GSM Module and GPS Module and you can placed SIM card of any network and then connect to the power supply. The total figure is shown in below.

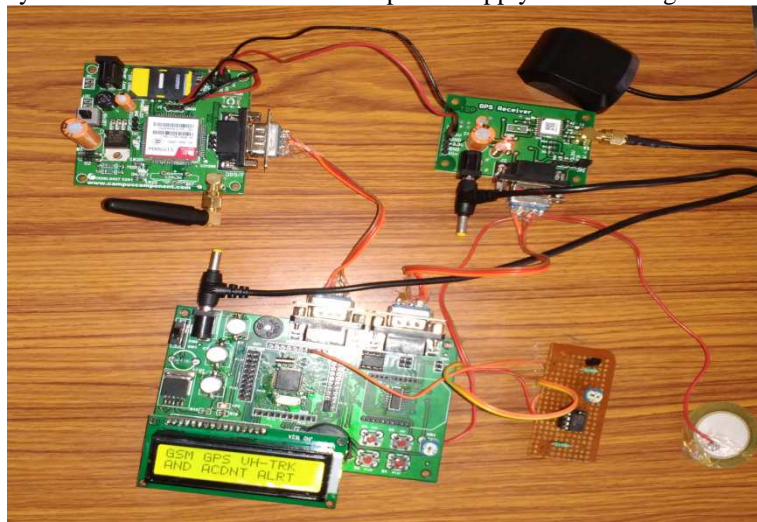


Fig-8: VTAI system

To Register our relation phone number for any emergency cases. First we can send a message to that SIM which is placed in GSM module with any character or letter, etc., and then the mobile number was registered.

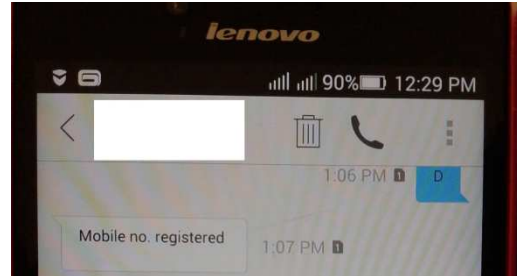
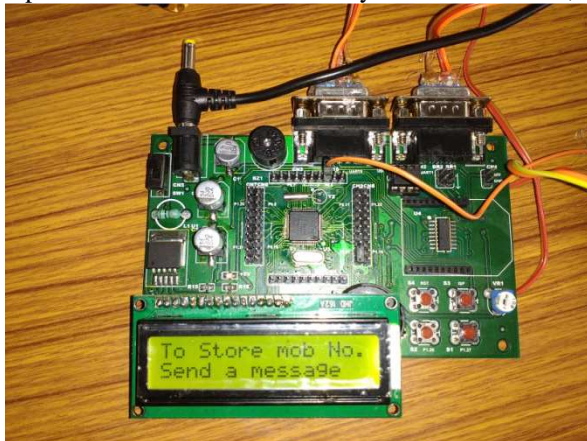


Fig-9: To store Mobile number send message like .

After registered our mobile number to the device after we can track the vehicle you can send a message as '*' to the mobile number which is placed in GSM module. After receiving message from register mobile number the GSM module send to information to the GPS system and the GPS module send reply to register mobile number as in the form of LATITUDE and LONGITUDE.

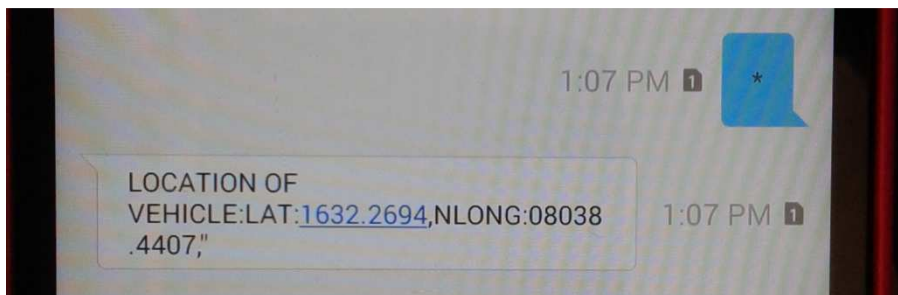


Fig-10: location in Latitude and longitude.

When vehicle met an accident the vibration sensor transfer the information to the ARM processor and then ARM processor transfer to GPS module and then to GSM. GPS module can transfer the latitude and longitude information to the GSM module. The GSM module can send a message to register number as the accident information.

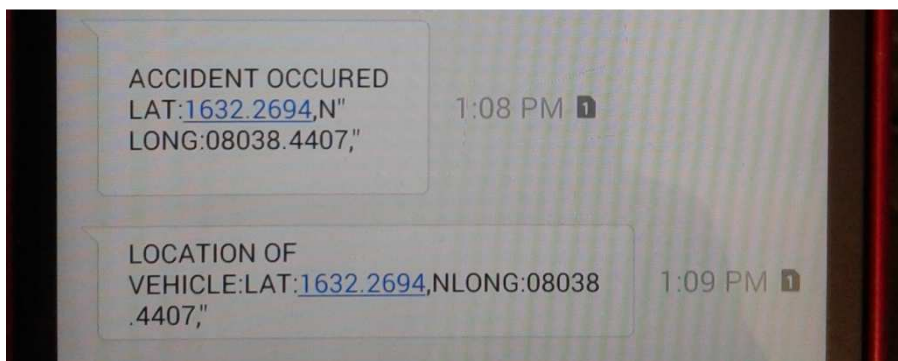


Fig-11: Accident information.

7. CONCLUSION

In this paper, we have proposed a method of vehicle tracking and accident identification systems used to track the vehicle by using GPS and GSM technology. When the responsible people send SMS to the GSM module, then it send a reply with latitude and longitude. After that registered person can help to the accident persons. In this method, easily track the vehicle place and to know the status of vehicle. The biggest advantage of our research is, whenever the sensor is activated we will be immediately getting the acknowledgement from GSM modem to our mobile numbers which are stored in ARM processor, without any delay. This system locates the accident spot accurately, realizing the automation of accident detection and messaging system. Consequently, it

will save the precious time required to save the accident victims. It involves automated security system that provides high security to driver through the use of GPS and GSM technologies. The GPS and GSM have been used for tracking the vehicles to identify the accident and theft location. This system has been incorporated as a single unit inside the vehicle.

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