



# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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## A Study on Vehicle Accident Alert System

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**ABSTRACT:** The advent of technology and increasing population has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. In this project as soon as vehicle meets with an accident the Vibration sensor will detect the signal and send it to the ARM controller. The ARM Microcontroller then sends the alert message consisting of the location of the accident spot through the GSM MODEM to police control room or to a rescue team. The police can immediately trace the location through the GPS MODEM, after receiving the alert message. After conforming the accident location the necessary actions will be taken. If the person driving the vehicle meets with a small accident and if there are no serious injuries to the person driving the vehicle or travelling in the vehicle, then the alert message can be terminated by the driver by a switch provided in order to avoid wasting the valuable time of the medical rescue team. As there is a scope for improvement and as a future implementation we can add a wireless webcam for capturing the images which will help in providing driver's assistance including the location of the accident site to registered mobile numbers.

**KEYWORDS:** LPC 2148 microcontroller, GSM Module, GPS Module.

### I. INTRODUCTION

Now-a-days, road accidents and traffic congestion are the major problem in urban areas, so that there is no technology for accident detection and also there is delay in reaching of the ambulance to the accident location and also become very difficult to know that an accident has occurred and to locate the position where it has happened. It is difficult to save the life of accident victims until the pass by notices them and take the initiative to inform the ambulance or police and if the accident occurs in a remote area then there will be very less hope for the survival of accident victims. We overcome these disadvantages, GSM and GPS technologies are used. The GPS based vehicle accident identification module contains a vibrating sensor and a GPS modem connected to the ARM Microprocessor. When an accident occurs, the vibration sensor gives the signal to the ARM microcontroller which sends the information through GSM network to the mobile.

The vehicle is tracked for every five minutes using GPS and the position of the vehicle is also send to the mobile in terms of latitude and longitude which is processed by the computer. The main aim of the project is to design an ARM based GSM and GPS accident detection system and to give indication to release of air bags. When an accident occurs, tilt sensor output changes and sends output signal to processor ARM so that the location is identified using GPS. The ARM 7 processor requires 3.3 volts of power supply, step down transformer of 230/18V is used to get the required Alternative Current (AC) output. To convert that Alternative Current (AC) supply to Direct Current supply will be done by using rectifier. Direct Current (DC) output consists of ripples, we use filter capacitors to remove those ripples. To get output voltages of +5v & +12v we are using voltage regulators 7805 & 7812. Finally 3.3v is given to the ARM microprocessor for functioning. ARM microprocessor consists of two modes of operation 1) Program mode and 2) Run mode. The first mode is Program mode is used for dumping of the program into ARM microprocessor from any external device such as computer and the Run mode is used for the execution of program. For the purpose of accident detection we use run mode of operation. When the accident occurs GPS is activated and it gives the values of exact location in terms of Latitude and Longitude.

For e.g: Accident occurred at location of

Latitude=1641.4095

Longitude=1725.3602



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Vol. 6, Issue 4, April 2017

The above values are then sent to the mobiles using GSM for which the mobile numbers are dumped in the program.

## II. SYSTEM MODEL AND ASSUMPTIONS

The exhaustive survey was carried out. The literature survey helped in understanding models used for accident detection and carried out the project work in primary stage. Now a days accidents occur in all the places but major accidents occur near schools and colleges because of over speeding of vehicles in that area. The main objective of this project is to provide security and medical help to the vehicle user and it also detects the accident if occurred and informs the respective authority through wireless technologies if any accident occurs. In this system, whenever a person sits in driving seat of the vehicle, the system checks the following parameters of the driver. The Alcohol sensor, which checks if the person has consumed alcohol or not. The eye sensor prevents the person in driver seat from falling asleep. In case of any accident, the vibration in vibration sensor increases beyond the limit then information is sent to GSM module. The GSM module sends message to police control room or rescue team. Thus this project ensures the life security of vehicle travelling in the vehicle.

In the current scenario due to traffic hazards and frequent road accidents causes huge loss of life and property because of the poor emergency facilities. An integrated GPS-GSM system is being developed to track vehicles using Google Earth application. The remote module has a GPS system mounted on it which identifies the current location of the moving vehicle, it then transfers data by GSM with other parameters acquired by the automobile's data port as an SMS to a recipient station. After data processing, Google Earth application is used to view the current position and status of each vehicle. The goal of this project is to manage fleet of vehicles effectively, police automobiles distribution and car theft cautions. An accelerometer is used in a car alarm application to detect dangerous driving. It can be used as a crash or rollover detector of the vehicle during and after a crash. When a vehicle meets with an accident immediately Vibration sensor will detect the signal in case if a car rolls over, the Micro electro mechanical system (MEMS) sensor will detect the signal and sends it to the ARM controller. The ARM controller then sends the alert message including the location through the GSM MODEM to police control room or to a rescue team. The police can immediately trace the exact location through the GPS MODEM, after receiving the alert message. After conforming the exact location necessary actions will be taken. If the person travelling in the vehicle meets with a small accident or if there are no serious injuries to anyone travelling in the vehicle, then the alert message can be terminated by the driver by a switch provided near the drivers seat in order to avoid wasting the valuable time of the medical rescue team. This system is useful in detecting the accident precisely by means of both vibrations.

## III. DIFFERENT SECTIONS

### GPS unit:

The GPS unit continuously sends the co-ordinates to the  $\mu$ c kit. These co-ordinates are received and stored in  $\mu$ c memory.

### Tilt switch:

Tilt switches to detect any accident. In case of accident message will be sent to preloaded number via the GSM modem.

### Panic Switch:

This is additional switch for emergency like theft. When such switch is pressed the location is send to the concerned person.

### GSM unit:

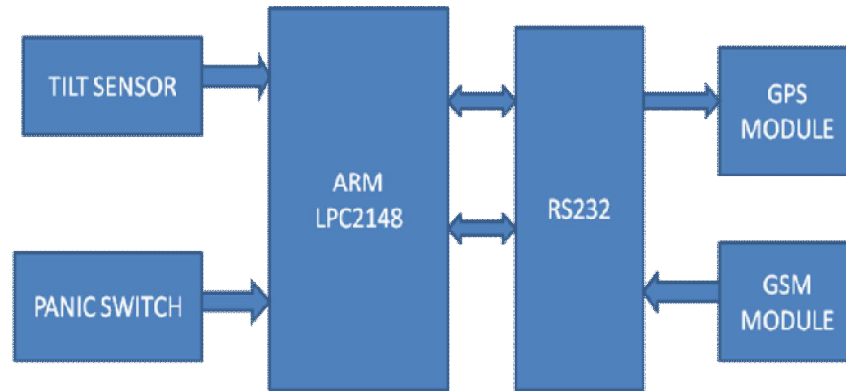
When the accident happen, the coordinates of that location are send to the concerned relative or control station.

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Vol. 6, Issue 4, April 2017



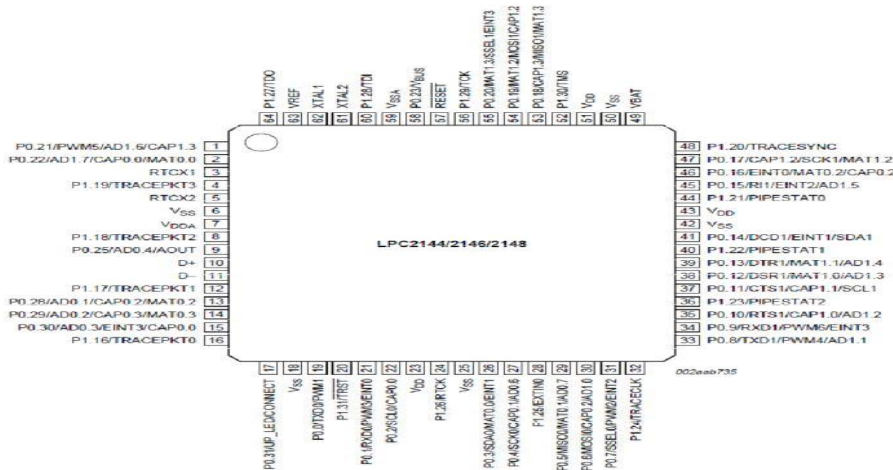
**Fig-Block Diagram of Vehicle Accident Alert System**

## CIRCUIT DIAGRAM

### Hardware Design & Selection Criteria of Hardware

#### Control Unit-

#### ARM7 (LPC2148) Microcontroller



**Fig: Pin description of LPC2148**

The LPC2148 microcontroller consists of a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, which combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. It is cheap and reliable. Pipelining is employed in order to simultaneously operate all parts of memory systems and processing systems.

The CPU has two types of instruction sets, one is Arm (32-bit) instruction set which gives maximum performance and other is Thumb (16-bit) instruction set which gives maximum code density. One of the main advantages of ARM is that in it we can manipulate 32-bit integers with a single instruction. One of the main advantages of Thumb is its ability to switch back to ARM instruction set which gives high speed to operate fast interrupts and other algorithms. This gives better performance than 16-bit architecture, and better code density than a 32-bit architecture.



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## GPS Module

The sending and receiving of radio signals is done by a satellite based navigation system known as The Global Positioning System (GPS). The GPS receiver receives these signals and provides the user with information. Using this technology, we can determine location, speed of a particular object any time during 24 hours a day, in any weather conditions anywhere in the world for free. GPS was previously known as the NAVSTAR (Navigation Satellite Timing and Ranging). GPS was originally developed for military purpose. As GPS navigation capabilities are popular and as GPS technology can be accessed using small, inexpensive equipment, the government made the system available for civilian use. The USA owns GPS technology and the Department of Defense does its maintenance. In GPS technology there is a set of 24 satellites which continuously orbit around the earth. These satellites are equipped with atomic clocks and they send out radio signals with the exact time and location. These radio signals from the satellites are picked up by the GPS receiver. Once the GPS receiver locks on to four or more of these satellites, it can triangulate the location of a particular object from the known positions of these satellites. It is a high performance, low power satellite based model. It is a cost effective and portable system which accurately detects the location.

## How it works

GPS satellites circle around the earth twice in a day in a very precise orbit and transmit signal information to earth. GPS receivers collect this information and use triangulation to find out the user's exact location. The GPS receiver compares the time when a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver about the user location. With distance measurements with the help of a few more satellites, the receiver can determine the user's position more precisely and displays it on the map.



## GSM Module

**GSM (Global System for Mobile Communications)** is a standard which was developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones. GSM is an open, digital cellular technology used for transmitting mobile voice and data services. GSM is a digital mobile telephone system that is widely used in Europe and all around the world. GSM uses a variation of TDMA and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). It operates either at 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

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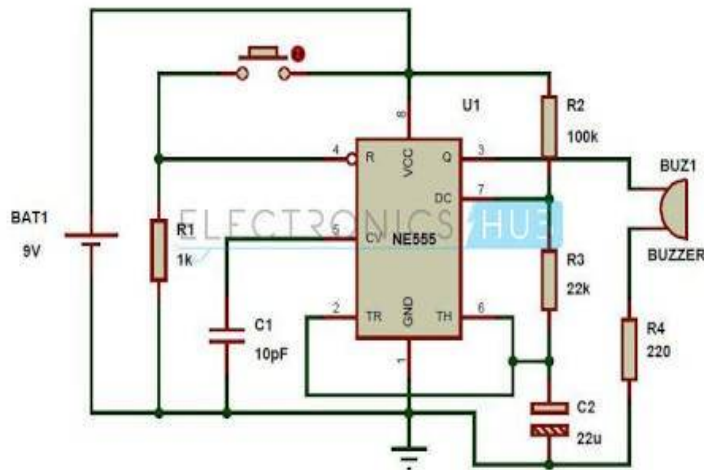
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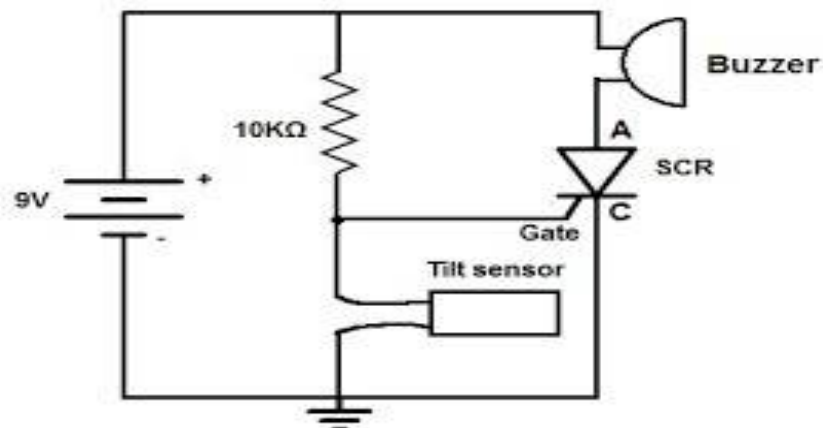
Vol. 6, Issue 4, April 2017



**Panic Switch:** This is additional switch for emergency like theft. When such switch is pressed the location is send to the concerned person.



- **Tilt switch**-Tilt switch are used to detect any accident. In case of accident message will be sent to preloaded number via the GSM modem.



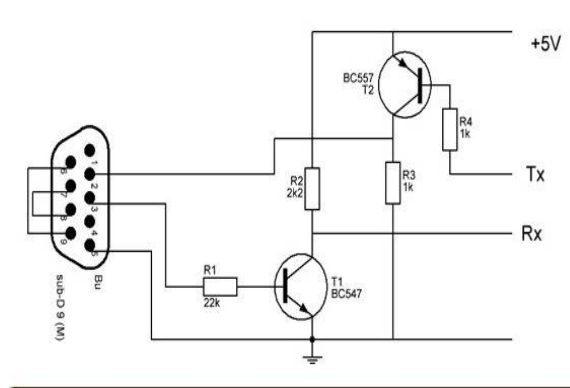
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- RS-232-In telecommunication, **RS-232** is a standard for serial communication transmission of data. It formally defines the signals connecting between a *DTE (data terminal equipment)* such as a computer terminal, and a *DCE (data circuit-terminating equipment or data communication equipment)*, such as a modem



## IV. WORKING

The system is initialized when powered ON. The system has two modes one is normal mode and other is abnormal mode. When the system is detected to be in abnormal mode, it is confirmed that the accident has occurred. Once it is confirmed that accident has occurs the buzzer will be on. The tilt sensor of the vehicle is checked to confirm the cause of the accident. The switch is scanned first; if it is a minor accident then the switch can be powered ON by the driver of the vehicle to terminate the message. If a major accident has happened, the switch is kept OFF and the message is then sent automatically to the police control room or to the rescue team after the exact location is detected by the GPS.

## V. SOFTWARE REQUIREMENTS

**KEIL  $\mu$ Vision IDE:** Keil provides a broad range of development tools like ANSI C compiler, macro assemblers, debuggers and simulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for Intel 8051, Intel MCS-251, ARM

**FLASH MAGIC:** Flash Magic is an application developed by Embedded Systems Academy to allow you to easily access the features of a microcontroller device. With this program you can erase individual blocks or the entire Flash memory of the microcontroller. This application is very useful for those who work in the electronics field. Using Flash Magic, you are able to perform different operations to a microcontroller device, operations like erasing, programming and reading the flash memory, modifying the Boot Vector, performing a blank check on a section of the Flash memory and many others.

## 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 with LPC2148 MCU in embedded system domain. The proposed Vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding accident. The proposed method will be highly beneficial for the automotive industry.

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**Vol. 6, Issue 4, April 2017**

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