

# SMART VEHICLE ACCIDENT DETECTION AND MESSAGING SYSTEM

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## Abstract:-

Fatalities and injuries resulting from road accidents are a major and growing public health problem in India. The incidence of accidental deaths has shown an increasing trend during the period 2008-2018. The problem of accident is a very acute in highway due to the complex flow pattern of vehicular traffic, the presence of mixed traffic along with pedestrians. Traffic accidents lead to loss of life and property. The aim of zero causality is although difficult, even considered impossible by some, but with the latest technologies and advancement in the field, it is possible to reduce the same. Our project will provide an exemplary solution for this drawback. The proposed system ensures the emergency facilities to the victims, as expeditiously as possible by letting hospitals or a rescue team to discern the accident spot with the help of the module embedded in the vehicle. When the vehicle meets with an accident, immediately, the sensor attached to microcontroller will detect the signal. The microcontroller, receiving coordinates from GPS MODEM, will send an alert message through GSM MODEM including location via SMS to the provided numbers. Since, they are aware of the location already; immediate medical assistance can be provided, reducing the medical risk.

**Key words:** - Accident Detection, Vibration sensor, GPS and GSM

## 1. Introduction:-

In today's world, there is an increase in the use of vehicles. Such more usage has increased the traffic. Because of the rapid rise in population, the use of vehicles is also increasing, hence, the accidents are increasing which has increased the risk of human lives as well. It causes human life loss because of unavailability of immediate safety facilities.

There were total 496,762 road accidents in 2016, as per the report of the National crime records bureau (NCRB) [1]. According to the Global Survey of Traffic, India suffered from road accident rate of 16.6 in a million people in 2013. As the report of 2010 in worldwide, deaths due to road accident were 1.25 million people, i.e. one person dies, every 25 seconds [2]. If no action is taken for road safety, road traffic accidents are estimated to result in the deaths of around 1.9 million People each year by 2020.

We are using an alarm system which helps in improving the emergency services for such type of accidents. This system is a single-board embedded system that contains a GPS and a GSM modem, connected to a microcontroller. This set-up is installed in the vehicle. It uses a vibration sensor as an input. The signal is then compared with the standard values of the sensor. If at any time, the current values are greater than this standard limit, the accident is detected by the micro-controller. Global Positioning System (GPS) is used to identify the location of the vehicle. GSM is used to inform the vehicle location. It sends GPS coordinates to the specified users on their mobiles, computers etc.

The project aims at an intelligent security system providing situational awareness and support safety. This system is designed and implemented as such an automated system that uses a smart-phone to

detect vehicle accidents. This system will have broad applications and in future, it will play an important role in day to day life.

This research paper is elaborated as follows. Section 2 introduces related work till now, Section 3 gives a brief summary about methodology, Section 4 presents hardware part of the system, Section 5 elaborates required software, Section 6 shows the results and in Section 7 conclusion and future works discussed.

## 2. Review of literature

In this section, we examine the existing literature to analyze various techniques in the detection of the vehicle accident.

**Albert Alexei and R. Ezhilarasie** presents a paper in March 2011 on Cloud Computing Based Vehicle Tracking Systems [3]. This system involves fuel level status, alcohol presence, the location of the vehicle, covered distance from the vehicle and forecast the arrival timing. All the output and real-time data from GPS and GSM will be stored in the cloud server. The licensed vehicle owner could easily access this cloud's data using a web portal. The system was tested successfully with the help of LED's and a stepper motor.

In 2013, **R. Ramani et al.** Designed a secure and reliable vehicle tracking and locking system which based on GSM and GPS modem [4]. If the car got stolen by a thief a message is sent by an authorized person with the help of GSM modem SIM 300 V7.03. A signal is generated to stop the engine of the motor. After then, all the doors locked. These doors are unlocked again by entering a password by the same person.

**Kunal Maurya, Mandeep Singh and Neelu Jain** made an Anti-theft Tracking System [5]. This embedded system employs a Global positioning system by which a high degree of accuracy in car tracking is possible. They installed this electronic device on the car which enables the owner to track down the vehicle's location. With GSM modem SUNROM SIM 900D, we can get notification of real-time data at any times. All system is designed with the help of AT89C51 microcontroller which belongs to the 8051 families.

In the month of October - December 2015, **Prasant Kokand et al.** present a paper on "Review on Accident Alert and Vehicle Tracking System" [6]. In their study, they studied different papers related to an accident detection system and gave a brief comparison of existing methods.

An assistance system prepared by **Pranav Dhole et al.** in 2015 is identified an accident and notified the nearest emergency service center, i.e. hospitals, police stations etc. [7]. Hardware part includes an Arduino controller which connects to Bluetooth module. Also, they launched an application for the vehicle owner to save the details of the new users, vehicles, contact number, Next of Kin Details, Ambulance service provider etc.

**M.V. Patil et al.** submitted a paper in 2017 to Vehicle Accident Alert System. They proposed a system based on an LPC2148 controller, which belongs to ARM-7 families. They divided their system into different section such that GPS unit, Tilt switch, Panic switch, and GSM unit to improve the performance of the same. Programming of the microcontroller is done in the Keil  $\mu$ Vision and Flash Magic software.

The accident alert system is a very new and advanced project. Different authors have been presenting their own reviews occasionally in this project. They use different sensing device, micro-controller and the output unit. With the time, the cost reduced accuracy increased and also more portable. However, AT89S52 controller gives the best accuracy to track down the location of the accident spot with

effective cost. Hence, we used this microcontroller in our project. Also, to give an alert to the registered person, a GSM and GPS module has been used.

### 3. Research methodology:-

The present study is descriptive in nature and it is based on both hardware and software design. The system is designed using Keil  $\mu$ Vision and Flash Magic software. With the help of the coding, we can easily operate the hardware part of this embedded system.

### 4. SYSTEM DESIGN:

The hardware design of the whole system which is shown in figure 1, can be easily divided into 4 different units; namely a) Power unit b) Sensing unit c) Controller unit d) Output unit

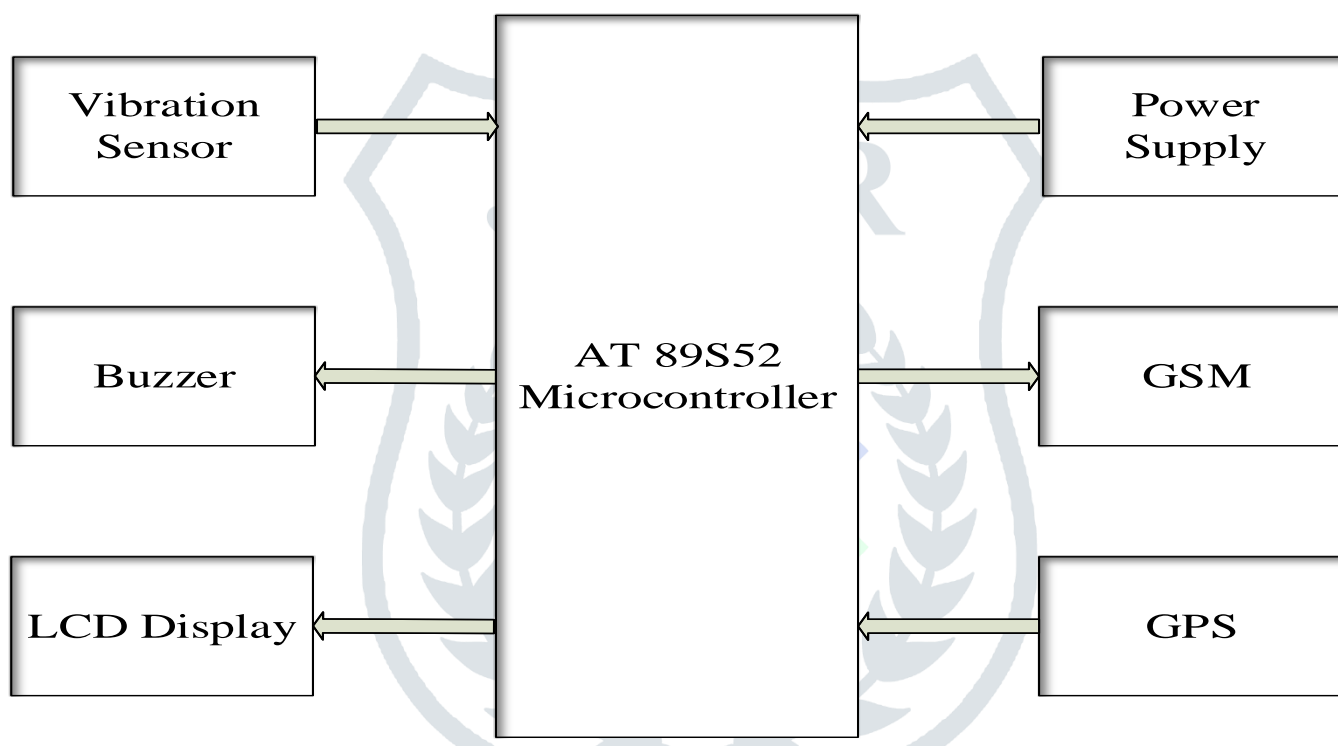


Figure: Block Diagram of the System

**A) Power supply:** It is an electronic device that provides electrical energy to an electrical load. Linear mode DC power supply is used in this system. Since our system required 8051 microcontroller, GPS and GSM, therefore, 12V of the voltage is sufficient. Thus, ac input available for main supply 220V is to be brought down to required 12 V DC voltage level using step-down transformer. It converts it into DC voltage using rectifier circuit. Rectification is done with the help of bridge wave rectifier and 470 micro-Farad, 35V capacitor. The 7812 voltage regulator is used for voltage regulation.

**B) Vibration sensor:** This sensor is for measuring, displaying and analyzing linear velocity, displacement and acceleration. In vibration measurement here, SW-18010P vibration sensor is attached that detects vibration behavior of the vehicle. When a vehicle meets with an accident or if a car rolls over, immediately vibration sensor will detect the signal as digital form (0 or 1) and sends it to micro-controller. Since the conductive time of the sensor is very low (2ms), it can measure any deflection easily.

**C) AT89S52 Microcontroller:** It's a low-powered, in built with CMOS technology, 8-bit microcontroller which consist 40 pins. This controller is manufactured with Atmel's technology. It consists of an on-chip Flash, which allows the program memory to be reprogrammed using memory pro-grammar. High-flexibility and cost-effectiveness are one of the main concerns in many embedded control applications which are easily filled up by the AT89S52. This microcontroller is much suitable for beginners of Atmel learner [9]. The microcontroller can easily be programmed and re-programmed using Flash Magic software with the help of USBASP programmer.

**D) Output unit:** The output unit included GPS module, GSM modem, LCD display and a buzzer to give an alert to users. It is the most important part of the system for user side, as they get the notification from the output unit. It is the most important part of the system for the user side, as they get notification from the output unit. The output unit is described below:

**I) GPS Module:** GPS is an abbreviation of Global Positioning System. The MT/5212 GPS module is preferred for this project, which is manufactured by Skirt Company. GPS is generally used to determine the location of a vehicle or a person from a remote location from anywhere on earth. The main application of this system is, tracking the vehicle using the GPS receiver.

This receiver gives the information about its position whenever required in the form of latitude and longitudes. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The GPS module calculates the position of any user, by recognizing the signals that are transmitted by the satellites.

**II) GSM Modem:** The SIM800D is a complete Quad-band GSM Module, which can be embedded easily. SIM800D delivers GSM/GPRS 800/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. This modem operation required only 3.4V to 4.4V supply. The GSM module which is Global System for Mobile communication is used to provide the communication from one place to another. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

**III) Buzzer:** A buzzer or beeper is an audio signaling device which may be mechanical, electromechanical, or piezoelectric. When an accident occurs, the buzzer turns on immediately. It gives an alert until the reset switch is pressed. An LED light also glows with buzzer simultaneously.

**IV) LCD display:** With the combination of solid and liquid, LCD display produces a visible image. An LCD display is either a flat-panel display or an optical device which produces images in color or monochrome in their backlight. LCDs are available to display both arbitrary images and fixed images like words, digits and seven-segment displays. Our system uses 16\*2 LCD display, which is able to display total 32 characters, numbers or special symbols.

## 5. SOFTWARE DESIGN:

The operation of the microcontroller AT89S52 is operated and controlled using the Keil  $\mu$ Vision IDE.  $\mu$ Vision allows creating a new test, verifying and better run of the application codes. For burning this code in micro-controller, Flash Magic software is used. Programming, modifying, erasing checking the performance on flash memory and many other functions are easily operated with the help of this software.

### a) Algorithm of the System:

*Step 1:* Initialize the power button.

*Step 2:* Give an output "accident detection system" from the LCD.

*Step 3:* Initialize GPS module with the current coordination.

*Step 4:* Wait for the vibration sensor to detect an accident.

*Step 5:* If an accident occurred, turn on the Buzzer instantly.

*Step 6:* Press reset switch with 10 seconds in case of minor accident.

*Step 7:* If button is pressed, reset all the system and jump to Step 2.

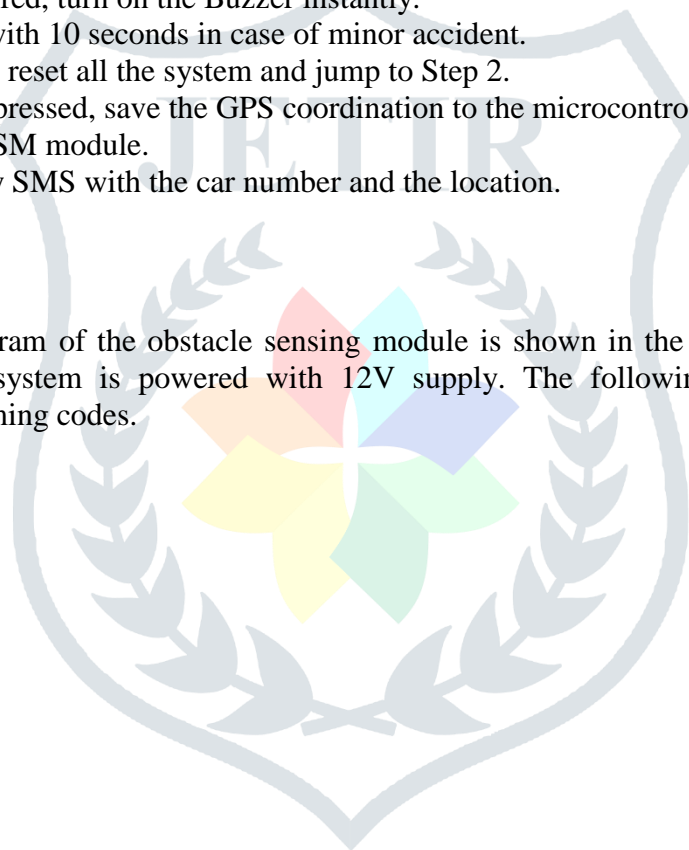
*Step 8:* If the button is not pressed, save the GPS coordination to the microcontroller.

*Step 9:* Send this data to GSM module.

*Step 10:* Send a message by SMS with the car number and the location.

### b) Flow Chart: -

The data flow diagram of the obstacle sensing module is shown in the following figure 2 which shows that initially, the system is powered with 12V supply. The following steps are involved in simulation of the programming codes.



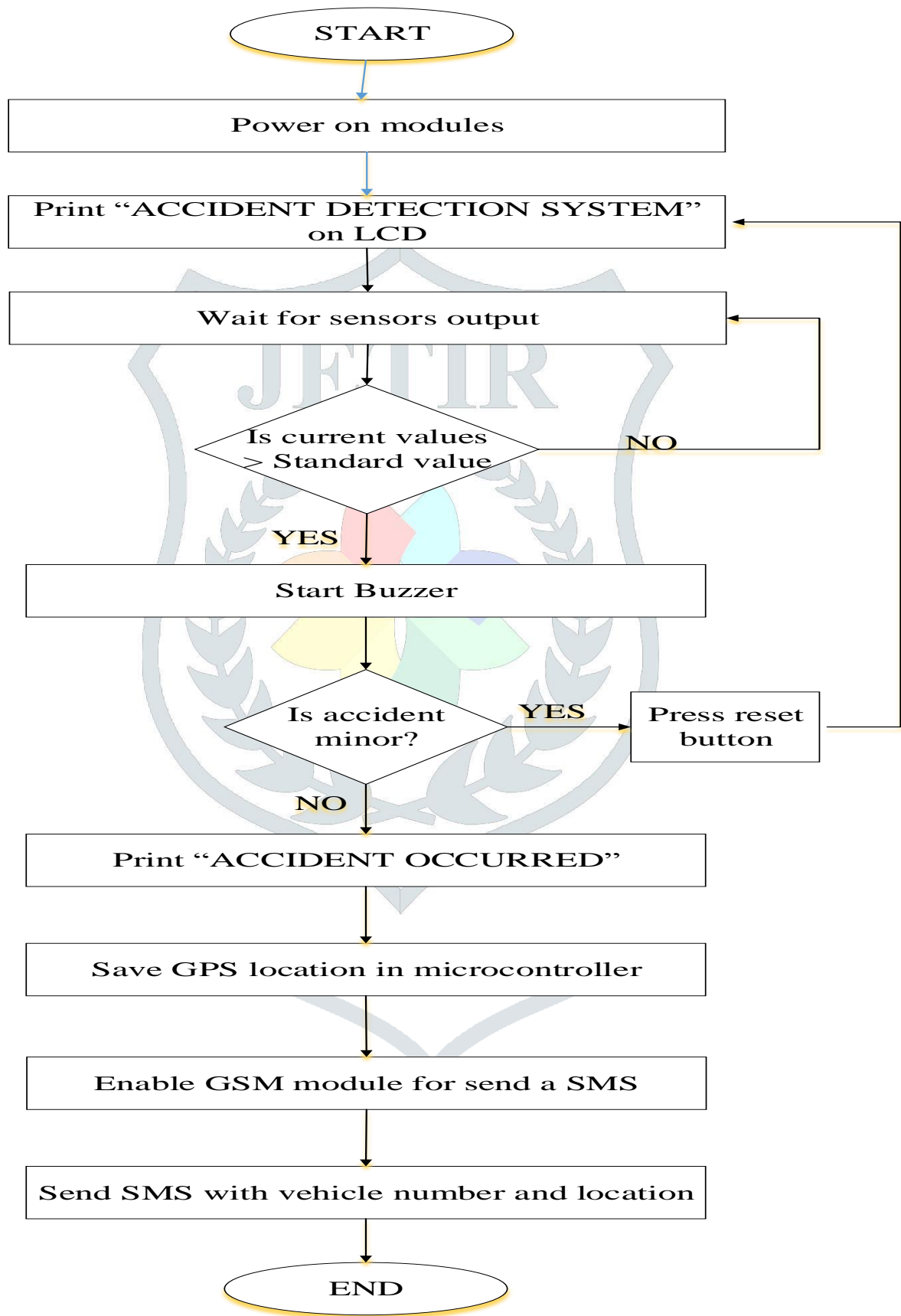


Figure: Flow chart of the system

## 6. RESULT:-

We have observed the performance of the accident detection system using GPS and GSM MODULES with SMS to user defined mobile numbers. It not only detects the accident location, but saves the victim's life as well. The project's aim was to build a smart vehicle system to cut down the limits of the existing methods and also enhancing security of vehicles & humans.

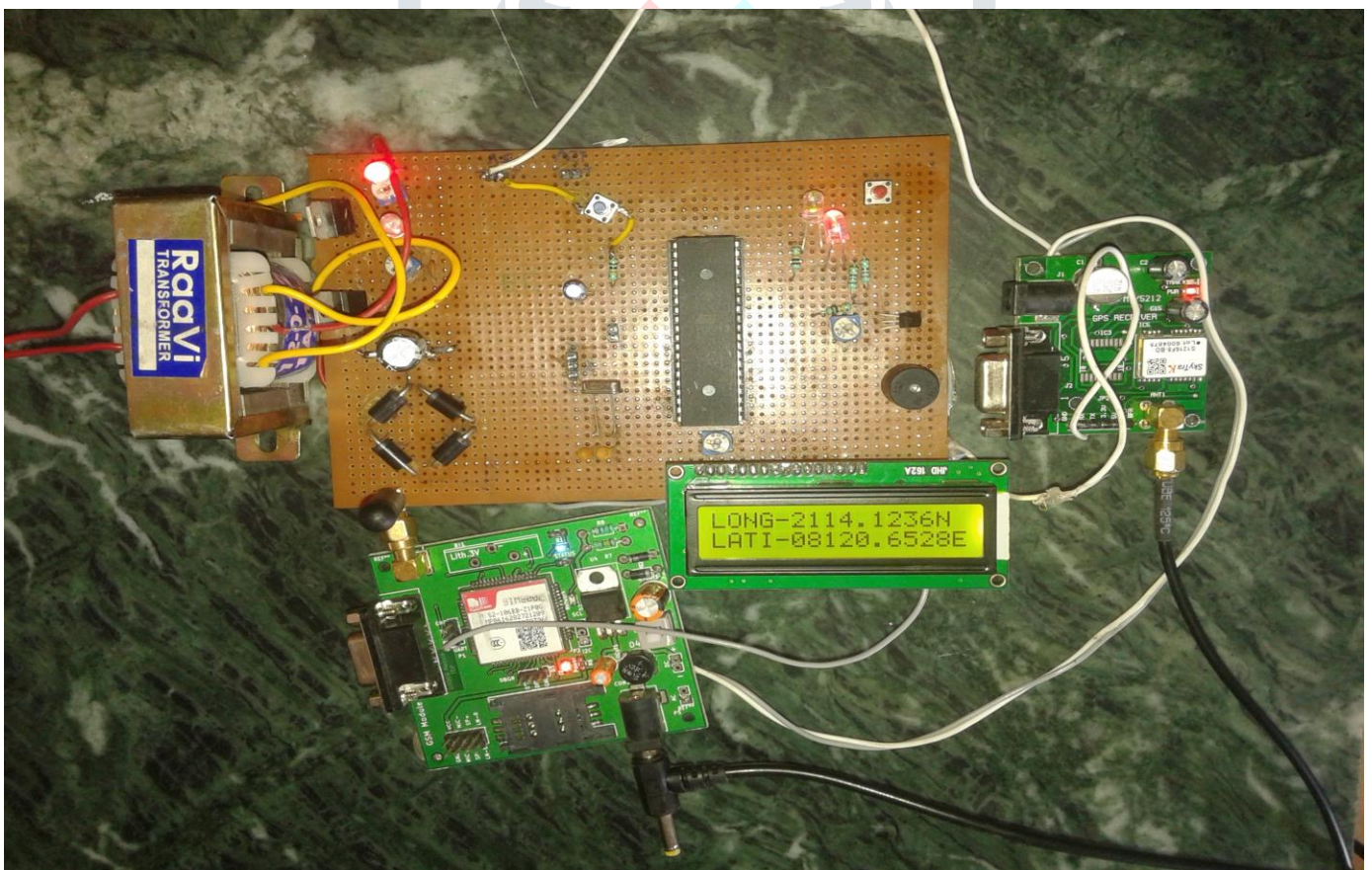
Whenever any accident will occur, the vibration sensor will sense the abnormalities. The LCD, attached to the device itself, will immediately display: "ACCIDENT OCCURRED". Simultaneously, GPS module will track the location wherever the accident has happened, and will send this information to GSM MODULE. AT89S52 controller is the heart of the system which helps in transferring the message to different devices in the system. A Sim card attached to this module will immediately send a link to the registered mobile number which will be, for e.g., of the form:

**"ACCIDENT HAS OCCURRED OF VEHICLE NUMBER CG07 LX 2240"**

**"LONGITUDE - 2123.1236; N**

**LATITUDE - 08120.6528; E"**

The following picture 3 depicts the real-time working of the "Smart Vehicle Accident Detection and Messaging System". In accident duration, the LCD displays visualize as "ACCIDENT OCCURRED" which helps user in accident time.



**Figure 3: System in working condition**

If the person meets with a small accident or if there is no serious threat to anyone's life, 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.

With the help of this technology immediate action can be taken when an accident occurs by alerting the respective people by sending a message. This made the project more user-friendly and reliable, proving to be one of the most useful innovations of the generation.

## 7. Conclusion and future work:

Speed is one of the significant causes of an accident. Now days, a GPS receiver has become an integral part of a vehicle. It can use a very cheap and popular GSM modem to send the accident location to the alert service center. Besides the automatic detection system, the vehicle occupant will be able to manually send the accident situation by pressing manual detection switch. A rescue measure in time with sufficient preparation at the correct place can save many lives. Thus, the proposed system can serve the humanity with great accuracy and cost-effectiveness, as human life is valuable.

In the future, it can be used as an anti theft system to track a vehicle, which is connected with the proposed device in it. It can also be used in wildlife tracking, asset tracking and in stolen vehicle recovery. In future we may integrate other related devices such as sensors. The alcohol sensors can be installed to monitor the driver status, which will reduce accidents on highways. When this system will be developed with IR sensor to sense obstacles in-front of the vehicle, accidents due to static obstacles could be avoided and in future, distance between vehicle and obstacles could be increased by replacing the IR sensor with the ultrasonic sensor. This system could be further enhanced with future technologies to provide further more safety and security to the vehicle systems.

## 8. Reference

Albert Alexei and R.Ezhilarasie, “Cloud Computing Based Vehicle Tracking Information Systems”, IJCST, Vol. 2, Issue 1, March 2011. [3]

[https://en.wikipedia.org/wiki/Traffic\\_accidents\\_in\\_India](https://en.wikipedia.org/wiki/Traffic_accidents_in_India) [2]

[https://www.keil.com/dd/docs/datashts/atmel/at89s52\\_ds.pdf](https://www.keil.com/dd/docs/datashts/atmel/at89s52_ds.pdf) [9]

[https://www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/](https://www.who.int/violence_injury_prevention/road_safety_status/) [1]

Kunal Maurya et al., “Real Time Vehicle Tracking System using GSM and GPS Technology-An Anti-theft Tracking System” IJECSE, Volume1, Number 3. [5]

M.V.Patil, Gaurav Singh et al, “A Study on Vehicle Accident Alert System” IJAREEIE Vol. 6, Issue 4, April 2017. [8]

Pranav Dhole, Saba Shaikh, Nishad Gite and Vijay Sonawane, “Smart Accident Detection & Assistance System” IJETST- Vol.02, Issue 04, Pages 2285-2288. [7]

Prashant Kokane, Sawant Kiran, et al., “Review on Accident Alert and Vehicle Tracking System” International Journal of Computer Science and Information Technology Research, Vol. 3, Issue 4, pp: (259-263), Month: Oct-Dec 2015. [6]

R.Ramani and S.Valarmathy, “Vehicle Tracking and Locking System Based on GSM and GPS”, I.J. Intelligent Systems and Applications, 2013, 09, Page Number 86-93. [4]