



# **Microcontroller Based Collision Detection and Warning System**

**Ms. Kajal Nandaniya<sup>1</sup>, Mr. Viraj Choksi<sup>2</sup>, Dr. M B Potdar<sup>3</sup>**

PG Student[IC], Dharamsinh Desai University, Nadiad, Gujarat, India<sup>1</sup>

Project Scientist, BISAG, Gandhinagar, Gujarat, India<sup>2</sup>

Project Director, BISAG, Gandhinagar, Gujarat, India<sup>3</sup>

**ABSTRACT:** The system envisioned is an automatic collision detection and warning system relying on a GPS module and a GSM modem. The vehicle to be safeguarded is to be fitted with the system sturdily ensuring good mechanical coupling with the entire chassis. In the case of an anticipated accident, the system detects it using the fact that the vehicle would be suddenly decelerated in such a condition. An accelerometer sensor continuously monitors the acceleration of the vehicle and will detect decelerations greater than threshold value and send the data to the microcontroller via an ADC. The controller compares this with the threshold set value and immediately sends an SOS message to preset numbers. With this message the controller also transmits the GPS coordinates of the vehicle which it continuously obtains from the GPS module. This system will also highly aid the search and rescue of vehicles that have met with an accident.

**KEYWORDS:** Embedded system, Microcontroller, Accelerometer sensor, GSM, GPS, ADC

## **I.INTRODUCTION**

Now a days the vehicle accident rate has been increasing as compared to previous decade. The accident rate has increased by 54%. This system minimizes the action time after an accident. This paper deals with such system to detect possible collision and prevent it. The aim of this work is to provide security to the people inside vehicles. In this system, basic microcontroller AT89S52 is used, which is cost effective. In this work, C programming is used for better accuracy and GPS module used to track the vehicle anywhere on the globe. GSM is used to send the exact location of the vehicle and also send alert or relax messages to this remote device (mobile phone)<sup>[1]</sup>.

To detect an accident, an accelerometer sensor is used. So, when accident happens, this sensor will be activated and the information is sent to microcontroller. At the same time, GPS and GSM modem will also gets activated which are interfaced to the same microcontroller. Through GPS, the latitude and longitude of the accident location are obtained. Through GSM modem, the same data is sent to the contacts which are stored in the database of system. With this system, information can be sent to the Police Stations, friends etc. and also the total action time can be minimized and thus we can save the lives in emergencies.



Fig. 1 Road Accident Site

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## II. LITERATURE SURVEY

Nowadays Wireless Sensor Networks (WSN) has been applied in various domains like weather monitoring, military, home automation, health care monitoring, security and safety etc. or in a nut shell one can say wireless sensor network can be applied in most of the domains. Traffic Signal System or traffic monitoring is a vast domain where WSN can be applied to gather information about the incoming flow of traffic, traffic load on a particular road, traffic load at particular period of time (peak hours) and in vehicle prioritization. WSN installed along a road can be utilized to control the traffic load on roads and at traffic intersections<sup>[8]</sup>.

The high demand of automobiles has also increased the traffic hazards and the road accidents. This is because of the lack of best emergency facilities available in our country. An automatic alarm device for vehicle accidents is introduced in this paper. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module<sup>[10]</sup>.

## III. SYSTEM BLOCK DIAGRAM

In this system, AT89S52 is used as main microcontroller. This system is designed for the Accident alert. The whole system is to be implemented on the vehicle itself. Therefore, when the accident happens, due to vibrations the accelerometer sensor gets activated. It measures the intensity of shocks and vibrations. Which are detected by the microcontroller through ADC0804. The ADC0804, which is the interface between ADXL335 and microcontroller AT89S52, which converts accelerometer sensor analog signal in to digital mode. With the GPS, the exact location of the accident site is determined. And here, GSM modem SIM300 is interfaced with microcontroller So that, when accident happens, the SMS will be sent automatically to the preset stored numbers entered in the database. Thus with this system rescue operation can be made faster.

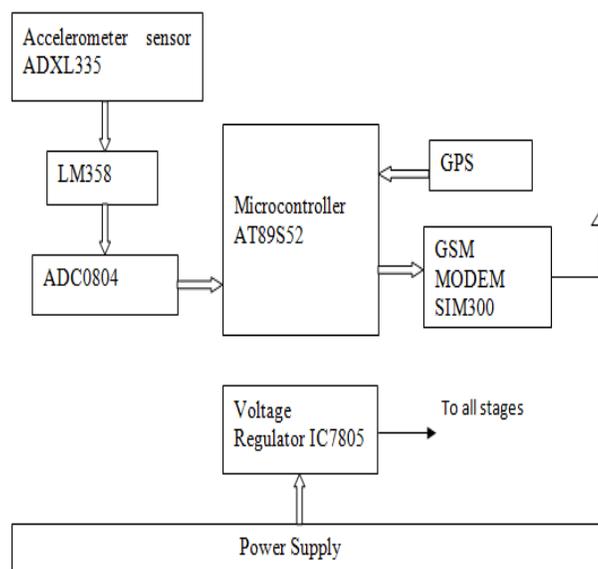


Fig. 2 Basic Block Diagram of Accident Alert System

## IV. SYTEM DESIGN AND IMPLIMENTATION

### FLOW DIAGRAM

The system is implemented in vehicle and the vehicles are monitored continuously through microcontroller. When the vibration intensity beyond threshold value of 3g is exceeded in accelerometer sensor, it sends data to the microcontroller through ADC. These sensors have threshold values depending on different vibration intensities, and then GPS module and GSM modem which are interfaced to Microcontroller are also activated. It is known that severe accident have greater than 3g and those with values less then 3g, accident are severe and not fatal. Therefore the threshold value is at 3g. The panic switch will be used when if accident is detected but no harm to lives then by pressing the panic switch manually relax message will be send.

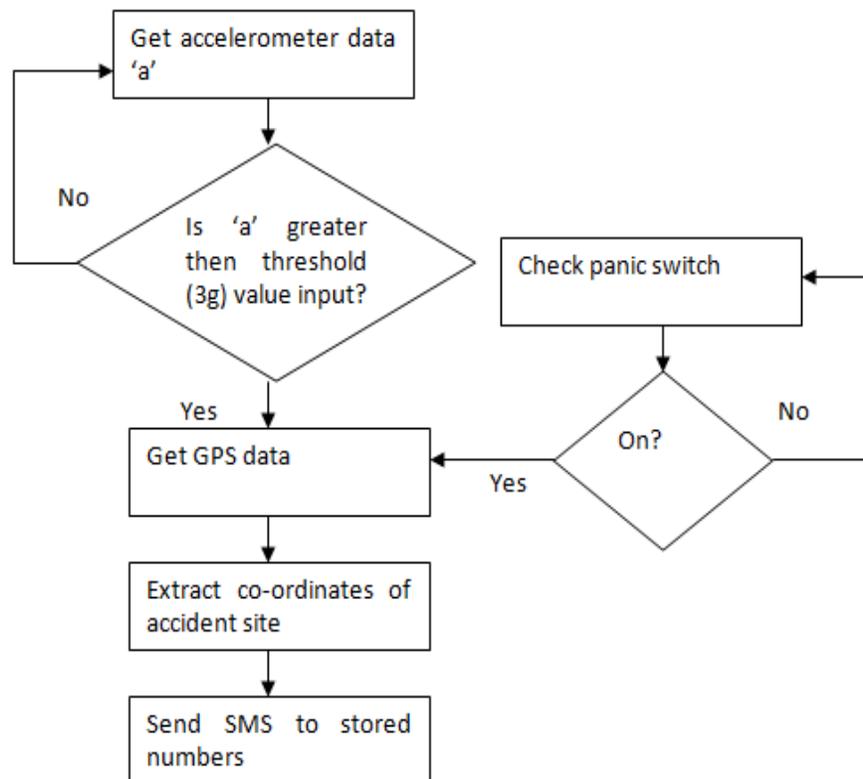


Fig. 3 Flow Diagram of Accident Alert System

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## SCHMATIC DIAGRAM

The Schematic Diagram of System is generated in Proteus (Simulation Software). All the Blocks of Different ICs and different components used in this system are available in Proteus library.

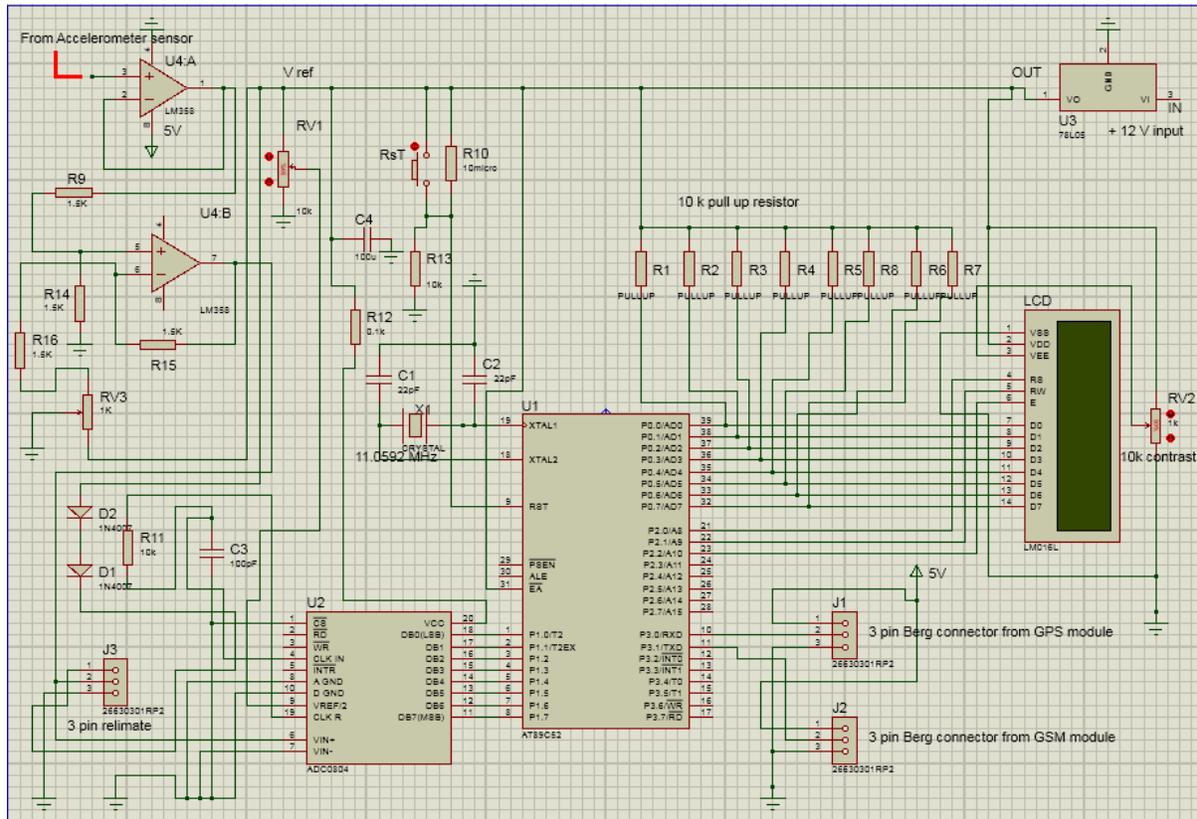


Fig. 4 Schematic diagram of Accident Alert System

## V. HARDWARE DESCRIPTION

System design contains following components:

Controlling Unit, Information Detection Module, GPS Location Module and Message Transmission Modem.

1. AT89S52 microcontroller is used in this system which is compatible with other modules which are used in this system.
2. GSM SIM300 is used for sending SMS
3. GPS from iwave is used which gives longitude and latitude information of accident location.
4. ADXL335 accelerometer sensor is used for vibration detection. It is a three axis accelerometer for detection of the different tilt angles and sense the vibration.
5. Op Amp is used for impedance matching.

## VI. SOFTWARE DESCRIPTION

1. Keil-- Keil is used for programming of the system in c
2. Flashmagic -- Flashmagic is used loading the code in to microcontroller
3. Proteus-- Proteus is used for designed schematic diagram

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### VII. RESULT AND DISCUSSION

System operates on three different modes:

Mode no.1

Longitude and latitude of accident place will be displayed on LCD when GPS extracts co-ordinates.

Mode no.2

Accident message will be displayed on LCD when accident is detected through accelerometer sensor (which senses the vibration and shock intensity) and Accident message will be sent to specified phone number.

Mode no.3

It applies when accident happens but does no harm to any person in vehicle. The Panic message will be display on LCD and Relax message will be send to the specified phone number which are stored in database of system program.

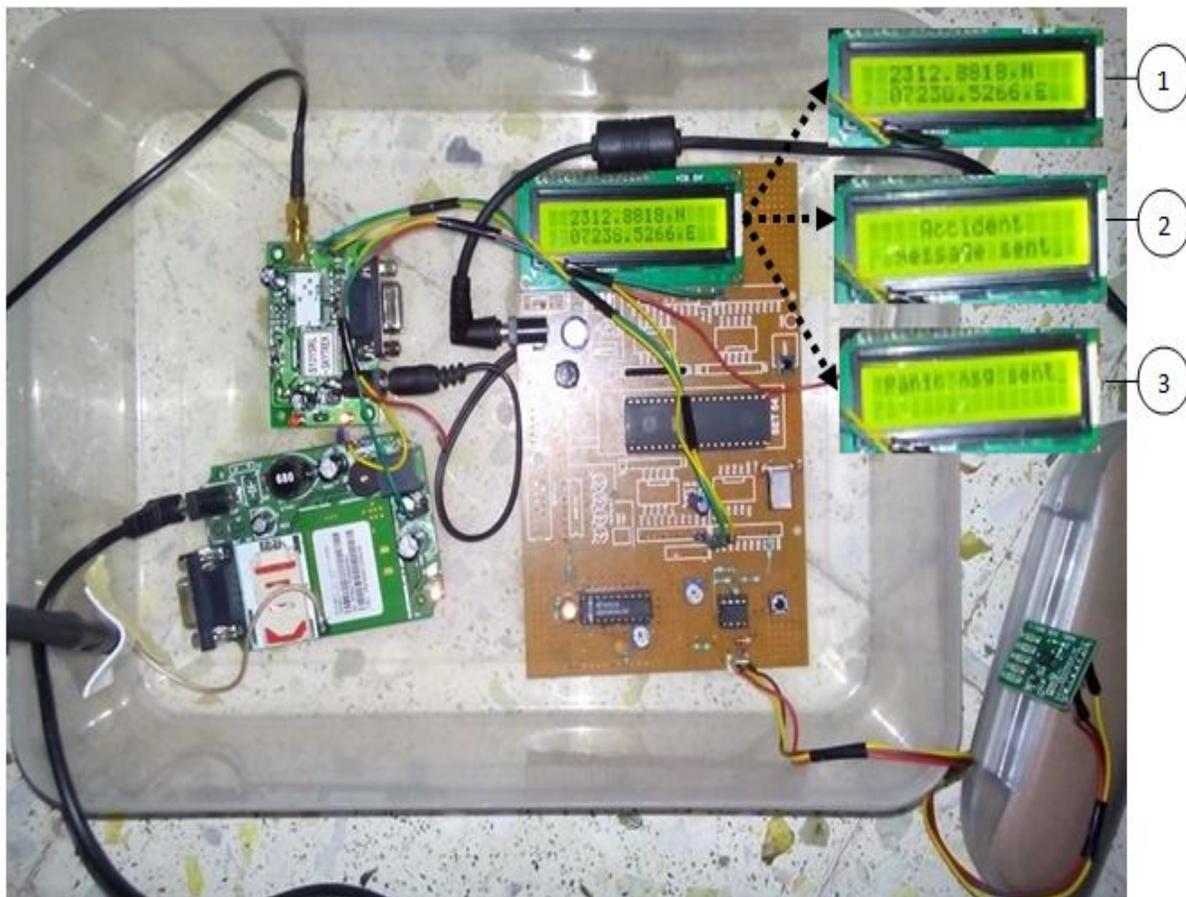


Fig. 5 Hardware model

### VIII. CONCLUSION

An Embedded System is designed which can be most useful for Accidents detection and prevention. It's a low cost, power efficient by which the action time can be minimized and exact location of an accident site can also be defined with GPS service and also the information regarding accident can be sent to particular contact numbers e.g., Police stations, Doctors etc..Because of the flexibility of embedded system, it is very much compatible to any kind of vehicles



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because design of this system is compact. Overall this system is very much affordable to a common man and this can be easily implemented.

## IX. FUTURE SCOPE

This system can be extended by using ARM processors and Arduino controllers instead of microcontroller for very fast operation of processors. And also the cameras can be interfaced with this system to map the exact scene of an accident. An improved new system can be designed which automatically shuts off vehicle engine when accident occurs. We can also use the onboard GPS-GSM modem for designed compactness.

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