AUTOMATIC VEHICLE ACCIDENT DETECTION AND MESSAGING SYSTEM USING GPS AND GSM MODULE

B.Tech Major Project Report

Submitted In partial fulfilment of the

requirement for the award of degree

Of

BACHELOR OF TECHNOLOGY
In

COMPUTER SCIENCE & ENGINEERING

Submitted by

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29TH August 2023

BHAGALPUR COLLEGE OF ENGINEERING, BHAGALPUR

Department of Computer Science & Engineering

CERTIFICATE

This is to certify that the present project work entitled "AUTOMATIC VEHICLE ACCIDENT DETECTION AND MESSAGING SYSTEM USING GPS AND GSM MODULE" submitted by **Manish Kumar (Reg. no. 19105108036), Md Faizan Zubair (Reg. no. 19105108002), Shubham Raj (Reg. no. 19105108001), Shambhav Kumar Azad (Reg. no. 19105108050)** in partial fulfilment of requirement for the award of degree of Bachelor of Technology in the department of **Computer Science & Engineering** to the **Bihar Engineering University, Patna,** in an authentic record of our work carried out at **Bhagalpur College of Engineering, Bhagalpur,** under my supervision and guidance.

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Examined & Approved on……

Internal Examiner External Examiner

BHAGALPUR COLLEGE OF ENGINEERING, BHAGALPUR

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DECLARATION

We,

Manish Kumar (Reg. no. 19105108036), Md Faizan Zubair (Reg. no. 19105108002), Shubham Raj (Reg. no. 19105108001), Shambhav Kumar Azad (Reg. no. 19105108050) Students of 8th semester Bachelor of Technology in the Department of Computer Science & Engineering, Bhagalpur College of Engineering, Bhagalpur, Hereby declare that the project entitled "AUTOMATIC VEHICLE ACCIDENT DETECTION AND MESSAGING SYSTEM USING GPS AND GSM MODULE" has been carried out by us and submitted in partial fulfilment of the course requirement for the award of degree in Bachelor of Technology in Computer Science & Engineering BEU, Patna during the academic year 2019-23.

The matter embodied in the report has not been submitted to any other university or institution for the award of any other degree or diploma.

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We take this opportunity to express our sincere thanks to all the staff members of BCE Bhagalpur for their cooperation and support. We would like to thank our family and friends who always supported and motivated us during the project. Special thanks to our **parents** for their unending support and patience.

Thanking You

Abstract

The Rapid growth of technology and infrastructure has made our lives easier. The advent of technology 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. Our project will provide an optimum solution to this draw back. An accelerometer can be used in a car alarm application so that dangerous driving can be detected. It can be used as a crash or rollover detector of the vehicle during and after a crash. With signals from an accelerometer, a severe accident can be recognized. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team. So the police can immediately trace the location through the GPS MODEM, after receiving the information. Then after conforming the location necessary action will be taken. 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 toavoid wasting the valuable time of the medical rescue team. This paper is useful in detecting the accident precisely by means of both vibration sensor and Micro electro Mechanical system (MEMS) or accelerometer. 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.

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Abbreviation

Abbreviation	Meaning
GSM	Global System for Mobile Communication
GPS	Global Positioning System
SMS	Short Message Service
AC	Alternating Current
DC	Direct Current
IC	Integrated Circuit
VCC	Voltage at the common collector
GND	Ground
LED	Light Emitting Diode
EEPROM	Electrically Erasable Programmable Read-Only Memory
TX	Transmitter
RX	Receiver
PCB	Printed Circuit Board
CT	Current Transformer
BSS	Base Station System
BPS	Bits Per Second
MEMS	Microelectromechanical systems
SIM	Subscriber Identity Module
LCD	Liquid Crystal Display

Chapter I

Introduction

1.1 Introduction

The high demand of automobiles has also increased the traffic hazards and the road accidents. Life of the people is under high risk. 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 whicha vehicle accident had occurred. This alert message is sent to the rescue team in ashort 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. The accident can be detected preciselywith the help of both Micro electro mechanical system (MEMS) sensor and vibration sensor. The Angle of the rolls over of the car can also be known by the message through the MEMS sensor. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

1.2 Background Study

Traffic accidents are a major public issue worldwide nowadays. A huge number of injuries and death as a result of road traffic accident uncovers the story of the global crisis of road safety. According to a statistical projection of traffic fatalities, the most obvious reason of a person's death during accidents is the unavailability of the first aid provision, due to the delay in the information of the accident being reached to the ambulance or to the hospital. The following is the list of patents analyzed before designing the Accident Alert System. It helped us to understand the interfacing of various components used in the project, such as GSM and GPS modems, and also the

practical implementation of such projects in real life. The analysis of these Research Papers helped to understand the current technologies prevalent in the field of accident notification system and to find better yet simpler alternatives to modernize such notification systems[1]. The following is the list of patents analyzed before designing the Accident Alert System. It helped us to understand the interfacing of various components used in the project, such as GSM and GPS modems, and also the practical implementation of such projects in real life. The analysis of these Research Papers helped to understand the current technologies prevalent in the field of accident notification system and to find better yet simpler alternatives to modernize such notification systems.

1.4 Objectives

The main objective of this work is to design and develop an automatic accident detection and notification systems. Total work can be summarized as:

- An ultrasonic sensor is used in a car alarm application so that vehicle in a dangerous region can be detected.
- An accelerometer and vibration sensors are used to detect the accident precisely with the rapid change of acceleration and vibration of the vehicle.
- When a vehicle meets with an accident immediately vibration sensor will detect the signal or if a car rolls over, accelerometer sensor will detect the signal and sends it to microcontroller.
- Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team.

1.5 Justification of Study

Response time is crucial for the timely delivery of emergency medical services to victims and has an impact on fatalities. The aim of our project is to reduce the amount of fatality in the accident by sending information of accident location.

1.6 Project Book Outline

Chapter I (Introduction)

This chapter covered introduction, Background study, objectives, and justification of this study. We have shown the basic working sphere of the system as well as differentiate our work with past technologies.

Chapter III (Literature Review)

This chapter mainly covered the vehicle accident detection system and prevention system, review of the related works is also described in this chapter.

Chapter III (Theory of the project)

This chapter we represent about in this project theory, description of hardware part and also describe every hardware parts feature and working principle with pin description. The working methodology of the system is described here.

Chapter IV (System Design and Fabrication)

In this chapter covered the practical implementation of component and describe the system design, fabrication, and working principle of the whole project. Making the flow chart and circuit diagram of the project are briefly described here.

Chapter V (Result and Discussion)

This chapter is about the result and discussion, advantage of the system, limitation, application and cost estimation has been discussed in this chapter.

Chapter VI (Conclusion)

Finally, we conclude this work by writing in their conclusion and future work.

Chapter II

Literature Review

2.1 Introduction to Vehicle Accident Detection System

The advent of technology has also increased the traffic hazards and the road accidents. Due to the lack of best emergency facilities available in our country the lives of the people are under high risk. An automatic alarm device for vehicles is introduced in this paper which sends the basic information to the medical rescue team within a few seconds of an accident. This device can detect accidents and sends an alert message to rescue teams in significantly less time which will help in saving the lives of thepeople. The alert message contains the geographical coordinates, time and angle in which the accident has occurred. In cases where there is no casualty the message can be terminated with the help of a switch in order to avoid wasting the valuable time of the rescue team.

2.2 Accident Prevention System

In this project work, we have studied and implemented a complete working model using a Microcontroller. The programming and interfacing of microcontroller has been mastered during the implementation. This work includes the study of GSM and GPS modems using sensors. The biggest advantage of using this project is, whenever the sensor is activated we will be getting the acknowledgement from GSM modem to our mobile numbers which are stored in EEPROM and GSM network operators have roaming facilities, and finding the location and sending information to user so that they can often continue to use their mobile phones when they travel to other countries etc.

2.3 Project Paper Analysis

The following is the list of patents analyzed before designing the Accident Alert System. It helped us to understand the interfacing of various components used in the project, such as GSM and GPS modems, and also the practical implementation of such projects in real life. The analysis of these Research Papers helped to understand the current technologies prevalent in the field of accident notification system and to find

better yet simpler alternatives to modernize such notification systems.
The following review related work show papers analyzed along with the names of their inventors, applicants and publication number.

2.3 Review of Related Work

In the authors have developed car accident detection and notification system that has combined smart phones with vehicles through the second generation of On-Board- Unit (OBD-II) interface to achieve smart vehicle modeling. The authors have developed an Android application that sent SMS to a pre-specified format with relevant data if an accident has encountered and could make an emergency callautomatically[2]. The OBD-II standard is mandatory since 2001 in the U.S and thereis also a European version of this standard. So, this solution is applicable to all vehicles in the U.S and European countries but not available in all vehicles in other countries. Besides, the maintenance or upgrading process of this system is an expensive operation.
In the E-call system has explored the possibility of implementing an automatic crash detection and notification service for portable devices Smartphone[3]. This system has used the cellular network to communicate between the portable device and the Server Center. The main limitation of the system is the E-call system has used Smartphone built-in accelerometer sensor as a crash sensor and the E-call system subjects to high rates of false positives emerging while the user is outside the vehicle.
In the authors at the University of Baghdad Iraq have developed a system which made use of the accelerometer, GPS and microphone to detect accidents. Upon detection of an accident sends an emergency notification to the web server and also sent an SMS to the emergency contacts, emergency responders have to access the web server to find out an accident[4]. Their system made use of the same sensors and hardware that the algorithm presented in this research work except for a few features. The main issue with this system is that the notifications are sent to a web server and responders needs to check the web server for accident notification, there is no system for individual responder that responded to the emergency to track victim's location and also the system lacked the functionality to send emergency notification to the nearest emergency center in case there is more than one emergency center in the area.
In the authors have developed a system called Wreck Watch which involves reading data from the accelerometer and acoustic data from the microphone to detect accidents[1]. If an incident has occurred, the application contacts nearby emergency

services and provides GPS-coordinates of the accident location.

In the authors have developed Difference analysis of GPS data base sources based on vehicle location system[5]. GPS technology can achieve an extremely high degree of precision and it is widely applied to many military and civilian. This paper specifies the database for the GPS data obtained from the error to make a specific analysis and introduction, so that GPS information can eliminate the error better and more quickly, and thus the data obtained from GPS, the accuracy of the database has further improved the database system, which further improving the accuracy of GPS so that itcan be better in the vehicle positioning.

In the authors developed Review of Automatic Speed Control of Vehicle using RFID Technology to reduce the rate of road accident they are propose a system which controls the speed of vehicle automatically in any critical zone, without major inconvenience to driver[6]. Here, there is review a model based on RFID technology. One RFID reader inside the vehicle reads the RFID tag placed either at speed limit signboard or at traffic light. A controlling module in the vehicle then takes thedecision and control the speed accordingly.

In the authors developed GPS and Map matching based vehicle accident detection system[7]. this paper proposes to detect an accident from the map matched position of a vehicle by utilizing the GPS speed data and map matching algorithm and send accident location to an Alert Service Center. The GPS provides speed and position in every 0.1 second. The position data will be used in the map matching algorithm to locate the vehicle on the road. The present speed will be compared with the previous speed in every 0.1 second through a Microcontroller Unit. Whenever the speed will befalling below the safe calculated threshold speed, the system will generate an accidentsituation. It will check the vehicle location from map matching module and generate an accident situation if the vehicle is found outside the road network. This will reduce the false accident detection drastically. The map matched accident location is then sent by utilizing the GSM network. The proposed system will save many accident victims with timely rescue.

Chapter III

Theory of the Project

3.1 Introduction

Consider a busy city scenario, where we have peak morning and evening hours. In peak hours, half of the city population rush to/from workplaces using public or private transportations or a highway scenario with different speed lanes. In each scenario, it is important to detect an accident if it occurs and report to an emergency alert center about an incident with additional information of the location.

3.2 Accident Detection Module

To detect an accident on road, first we need to know the all events that we can assume in case of accident. Here are three major events that can help in accident detection.

- Collision: A vehicle can collide with other vehicle or any other solid object, as a result driver or passenger inside the vehicle can get injuries.
- Roll-over: A vehicle may roll-over when an incident occurs. This is one of the dangerous events that may end-up with the several injuries or death of passengers including drivers.
- Speed: If accident happens, the vehicle would stop suddenly. In normal situation, if brakes are applied on the vehicle, it takes a certain amount of time and travel few feet before coming to the stationary position depending uponthe speed of the vehicle.

3.3 Methodology

We have divided our whole project work with seven phases of our project. Using the Waterfall model, we have completed our project very readily. The waterfall model is a sequential process to solve any problem to develop any system it should arrange the

whole work in the segment so that accuracy can be provided. We used the waterfall model in our system because it is seven stage attributes and feedback opportunity system the characteristics of our workflow is it can return to previous steps. If we want to modify our system at any point according to equipment so we will do it depends on our requirement. In this workflow, each phase must be completed completely before the next steps may begin.

3.3.1 Waterfall Model of Methodology

This project has been completed by following strategy, which is given below:

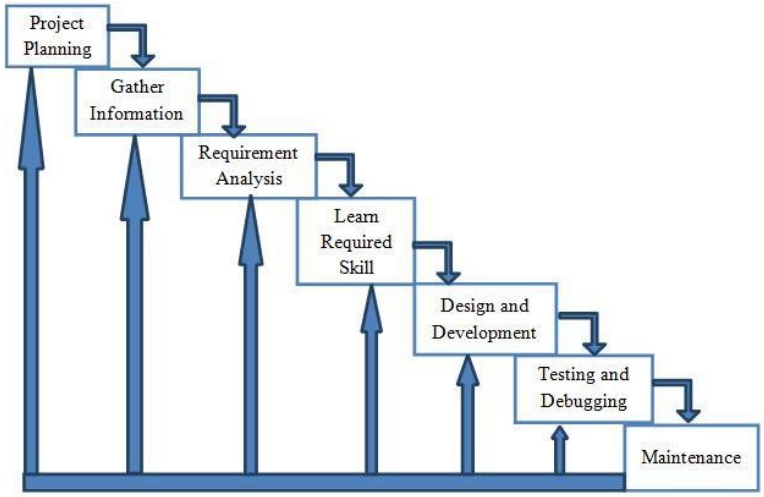


Figure 3.1 Waterfall model of the project [12]

3.3.2 Description of Methodology

Full work has been divided into seven parts. The work is done part by part.

- **Project Planning:** We seek for some problems in our real life. Then we found this problem and planned to solve the problem.
- **Gather Information:** We read some research papers related to accident detection problem. We search on the internet to find solutions.
- **Requirement Analysis:** We use Arduino Uno, GPS, GSM, Accelerometer, ultrasonic sensor, LCD Display, transformer, voltage regulator IC, Buzzer, Vero board, capacitor, Diode, resistor, etc.
- **Learn Required Skill:** To complete the project, we learned C++ language,

Arduino Uno language, hardware connection.

- **Design and Development:** We developed a device which the system communicates with the web server through GPS communication via a GSM. It will send the vehicle location's latitude and longitude data to the web server upon user request or after detection of the accident.
- **Testing and Debugging:** Final module testing aims to demonstrate correctness, whereas testing during debugging is primarily aimed at locating errors.
- **Maintenance:** Hardware project maintenance presents the full scope and understanding how to function should operate and be managed in an implementation area. Actions necessary for retaining or restoring a piece of equipment, machine, or system to the specified operable condition to achieve its maximum useful life. It includes corrective maintenance and preventive maintenance.

3.4 Requirement Analysis

Requirements analysis also called requirements engineering, is the process of determining user expectations for a new or modified product. These features, called requirements, must be quantifiable, relevant and detailed. In software engineering, such requirements are often called functional specifications. Requirements analysis is an important aspect of project management.

3.5 Hardware Requirements

1. Arduino UNO
2. Microcontroller (AT mega 328P)
3. GSM Module (SIM800L)
4. GPS Module (NEO-6M)
5. Accelerator Sensor (ADXL335)
6. Ultrasonic Sensor (HC-SR04)
7. Vibration Sensor
8. Transformer
9. Voltage Regulator (LM7805)
10. LCD Display
11. Buzzer
12. LED Bulb
13. Resistor
14. Jump wire
15. Power source

3.6 Software Requirements

1. Arduino Uno
2. Language C++

3.7 Arduino UNO

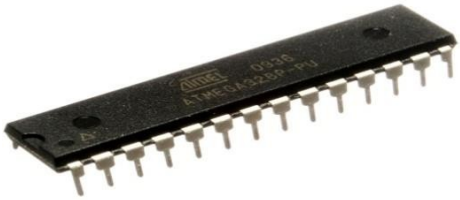
Figure 3.2 Arduino Uno [13]

3.7.1 Specifications

Table 1 Arduino Uno Specifications

Name	Specification
Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 Hz

3.7.1 Microcontroller (AT mega 328P)



3.7.2 Key Parameters

Table 2 Microcontroller (AT mega 328P) key Parameter

Parameter	Value
CPU type	8-bit AVR
Performance	20 MIPS at 20 MHz[2]
Flash memory	32 kB
SRAM	2 kB
EEPROM	1 kB
Pin count	28 or 32 pin: PDIP-28, MLF-28, TQFP-32, MLF-32[2]
Maximum operating frequency	20 MHz
Number of touch channels	16
Hardware Touch Acquisition	No
Maximum I/O pins	23
External interrupts	2
USB Interface	No
USB Speed	–

3.1 GSM Module (SIM900A)

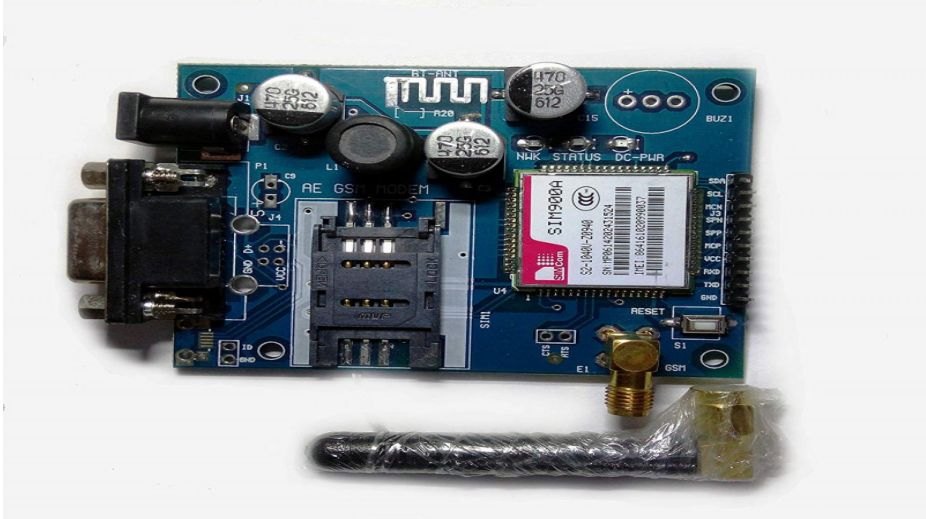


Figure 3.4 GSM Module (SIM900A) [15]

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates. There are various cell sizes in a GSM system such as macro, micro, Pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, Pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

3.8.1 Features of GSM Module:

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management
- High-quality speech
- Uses encryption to make phone calls more secure
- Short message service (SMS)

3.8.2 Specification

- Supply voltage: 3.8V - 4.2V
- Recommended supply voltage: 4V
- Power consumption:
    - sleep mode < 2.0mA
    - idle mode < 7.0mA
    - GSM transmission (avg): 350 mA
    - GSM transmission (peek): 2000mA
- Module size: 25 x 23 mm
- Interface: UART (max. 2.8V) and AT commands
- SIM card socket: micro SIM (bottom side)
- Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)
- Antenna connector: IPX
- Status signaling: LED
- Working temperature range: -40 do + 85 ° C

3.2 GPS Module (NEO-6M)

Figure 3.5 GPS Module (NEO-6M)

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance u-box 6 positioning engine. These flexible and cost-effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-box 6 positioning engine boasts a TimeTo-First-Fix0(TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlate's, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performanceeven in the most challenging environments. For more details, check the datasheethere.

3.9.1 Feature

- A complete GPS module with an active antenna integrated, and a built-in EEPROM to save configuration parameter data.
- Built-in 25 x 25 x 4mm ceramic active antenna provides strong satellite search capability.
- Equipped with power and signal indicator lights and data backup battery.
- Power supply: 3-5V; Default baud rate: 9600bps.
- Interface: RS232 TTL.

3.3 Accelerator Sensor (ADXL335)

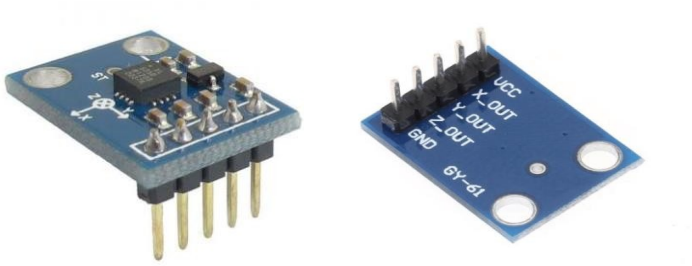


Figure 3.6 Accelerometer sensor (ADXL335) [17]

The ADXL335 is a small, thin, low power, a complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX,CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package.

3.10.1 Pin Description

Table 3 Accelerometer sensor (ADXL335) Pin Description

Number of Pin	Configuration
1	This is VCC pin and is used for power on the ADLX 335 accelerometer. It is connected with 3.3V dc power source
2	This is ground pin and is used for supplying ground to this ADLX 335 accelerometer. It is connected with source ground.
3	This is X pin and is used for analog input in x axis dimension.
4	This is Y pin and is used for analog input in y axis dimension.
5	This is Z pin and is used for analog input in Z axis dimension.

3.4 Ultrasonic Sensor (HC-SR04)

Figure 3.7 Ultrasonic Sensor IC (HC-SR04) [18]

The ultrasonic sensor uses sonar to determine the distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2cm to 400 cm or 1" to 13 feet. Its operation is not affected by sunlight or black material like sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect). It comes complete with an ultrasonic transmitter and receiver module.It emits an ultrasound at 40 000 Hzwhich travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance.

3.11.1 Features:

- Power Supply : +5V DC
- Quiescent Current : <2mA
- Working Current : 15mA
- Effectual Angle : <15°
- Ranging Distance : 2cm – 400 cm/1″ – 13ft
- Resolution : 0.3 cm
- Measuring Angle : 30 degree
- Trigger Input Pulse width : 10uS
- Dimension : 45mm x 20mm x 15mm

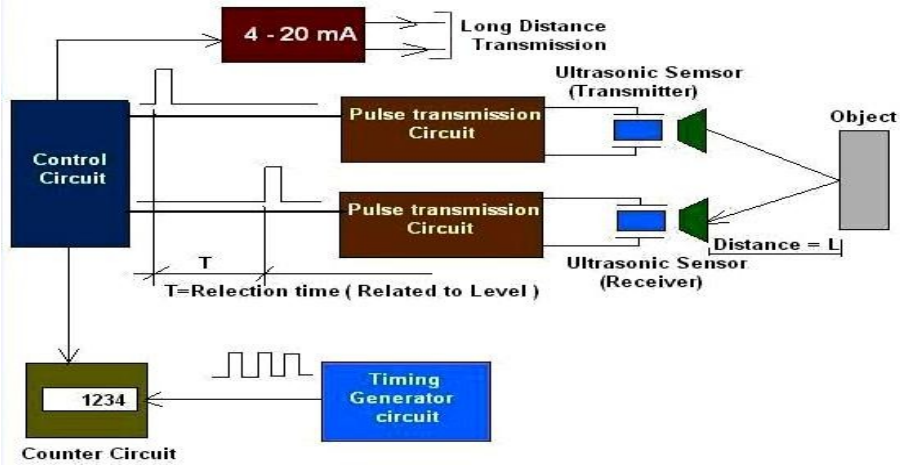


Figure 3.7.1 Ultrasonic Sensor Block Diagram [19]

In order to generate the ultrasound, you need to set the Trig on a High State for 10 µs. That will send out an 8 cycle sonic burst which will travel at the speed sound and it will be received in the Echo pin. The Echo pin will output the time in microseconds the sound wave traveled.

For example, if the object is 10 cm away from the sensor, and the speed of the sound is 340 m/s or 0.034 cm/µs the sound wave will need to travel about 294 u seconds. But what you will get from the Echo pin will be double that number because the sound waves needs to travel forward and bounce backward. So in order to get the distance in cm, we need to multiply the received travel time value from the echo pin by 0.034 and divide it by 2.

3.11.2 Pin Description

Table 4 Ultrasonic sensor pin Description

Pin No	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	The trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

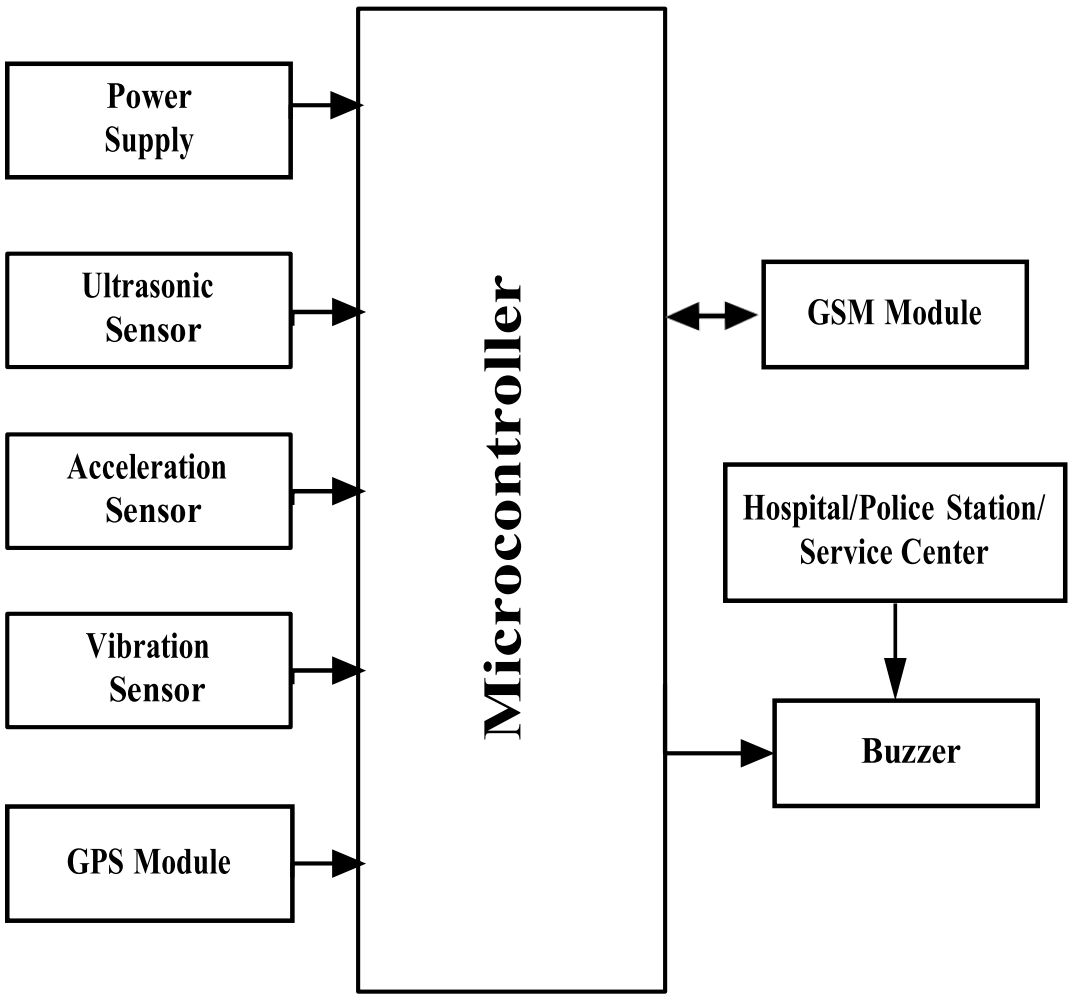
Chapter IV

System Design and Fabrication

4.1 Introduction

In this chapter fully discuss about the project design and fabrication. A general block diagram has been developed and implement according diagram. Here we described overall project description, implementation procedure and working principle. Total project flow chart is also available in this chapter.

4.2Block Diagram



4.1 Circuit Diagram

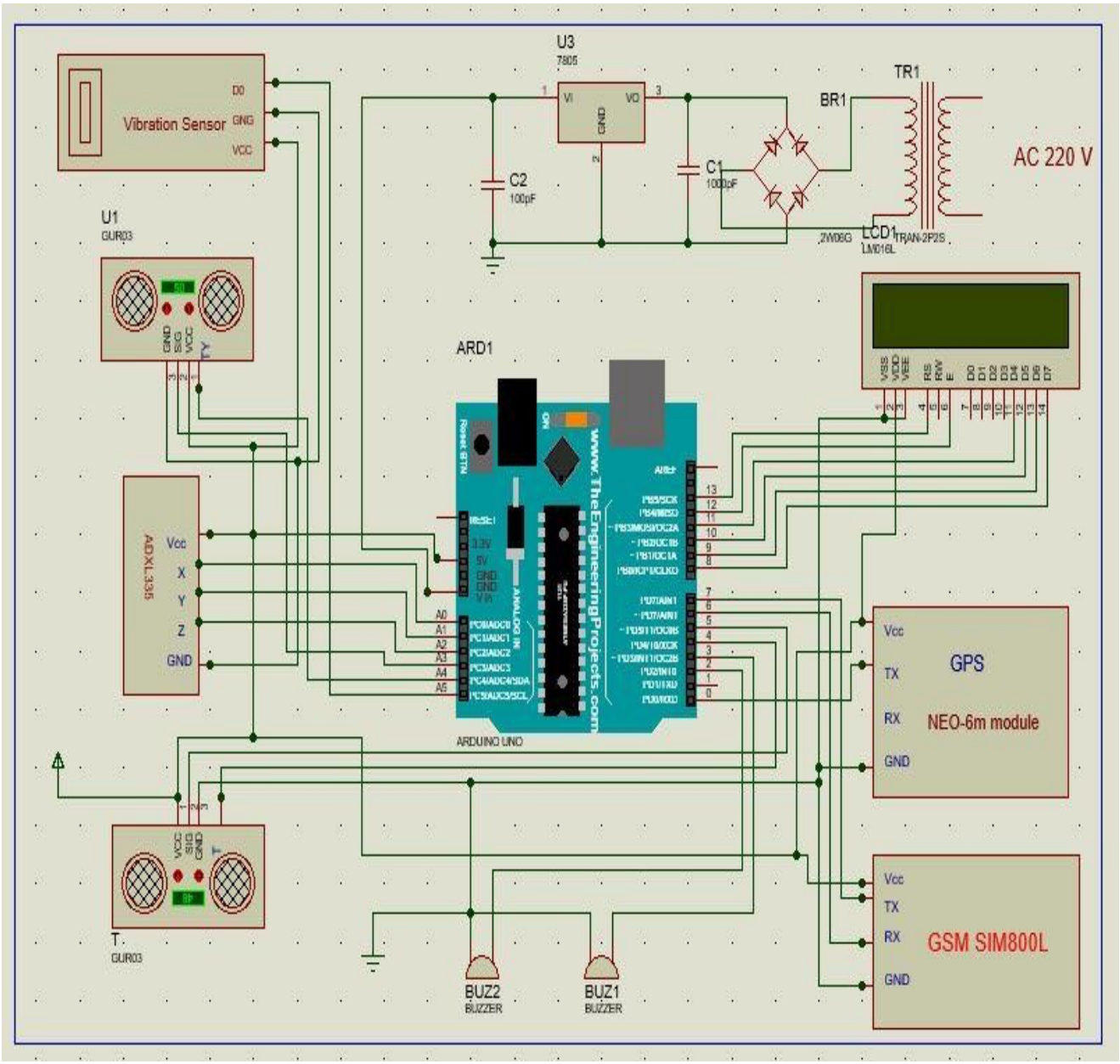


Figure 4.2 Circuit diagram of vehicle accident detection

4.1.1 Working Principle

Circuit connection for our Accident Alert System device is not so complex. Here Tx pin of GPS module is directly connected to RX pin (RX0) of Arduino Uno. By using Software Serial Library here, we have allowed serial communication on pin RX0 and TX0, and made them Rx and Tx respectively and left the Rx pin of the GPS Module open. By default, pin 0 and 1 of Arduino are used for serial communication but by using the Software Serial library, we can allow serial communication on other digital pins of the Arduino. 5 Volt supply is used to power the GPS Module. GSM module's Tx and Rx pins of are directly connected to pin D8 and D7 of Arduino. For GSM interfacing, here we have also used software serial library. GSM module is also powered by 5v supply. An optional LCD's data pins D4, D5, D6, and D7 are connected to pin number 12, 11, 6, and 5 of Arduino. Command pin RS and EN of LCD are connected with pin number 4 and 3 of Arduino and RW pin is directly connected with ground. A Potentiometer is also used for setting contrast or brightness of LCD. An Accelerometer is added in this system for detecting an accident and its x,y, and z-axis ADC output pins are directly connected to Arduino ADC pin A0, A1, and A2.

4.2 System Description

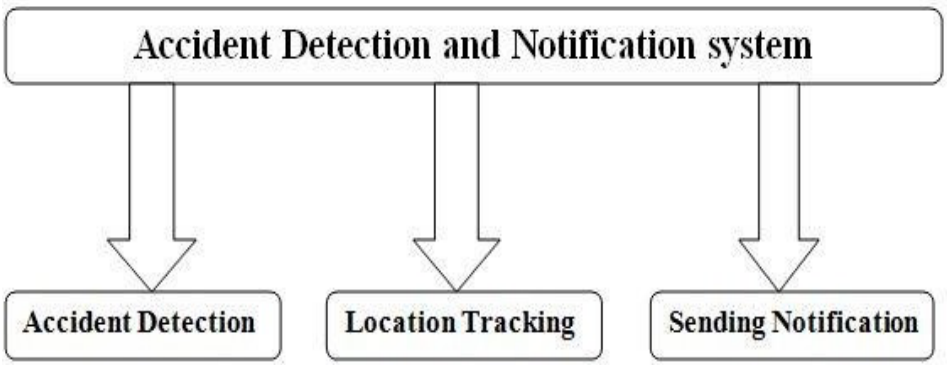


Figure 4.3 system description models

The project is divided into three phases. They are.

Accident Detection:

An accelerometer sensor senses the accident when the vehicles are fallen down detection x, y, z. initially the angle of the vehicle is zero degree and it could be increase 360 degrees towards any axis. If the angle of the vehicle rises in any direction exceeds our threshold value, the accelerometer considers the situation as an accident. The threshold value in X and Y axis are 320 and 320, respectively. The sensor has sent the signal to the microcontroller. We have used two ultrasonic sensors in front and back of the vehicle. Ultrasonic sensor is always turn on when any object reaches within 5 cm of the vehicle which sometimes create false prediction of collision.

Location Tracking:

The GPS sensor can detect the current location of the vehicle. In our proposed system we use the GPS device to find the exact accident location. When microcontroller receives any signal of accident it requests for current location of accident spot to the GPS. The GPS sends the location of accident spot to the microcontroller.

Sending Notification:

With accident location link GSM sends text message to the hospital and police control room. The hospital and police control room will get a message along with the map link which will contain the exact latitude and longitude details of the location. In the same time, nearest police station receives an accident occurs message with linkGoogle map. With the help of these details, the ambulance can take the shortest route to the accident location and reduce the time to save the victim.3.4.1System Description Model

4.6 Flow Chart of the System

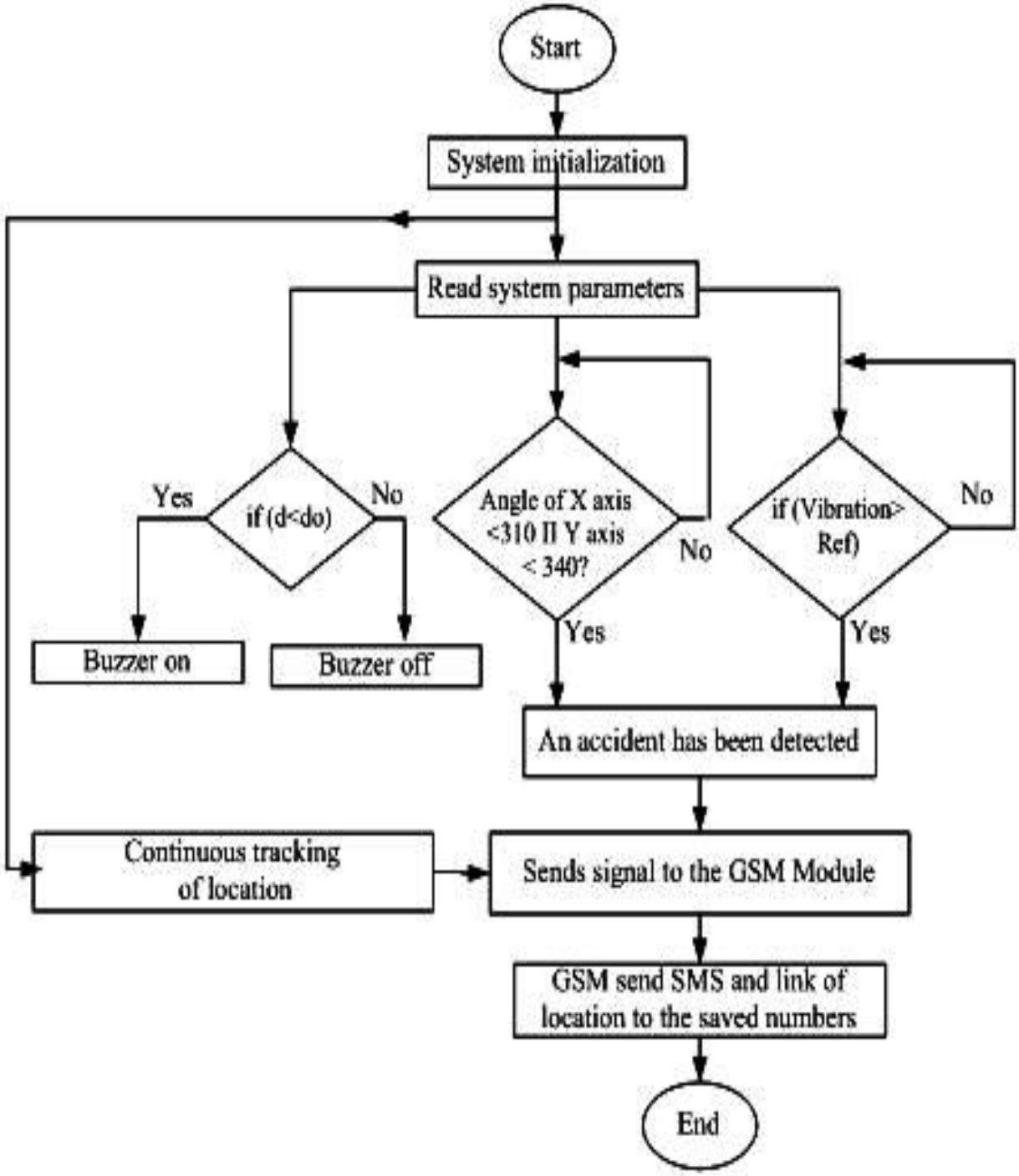


Figure 4.4 Flow Chart of the accident detection of the system

Chapter V

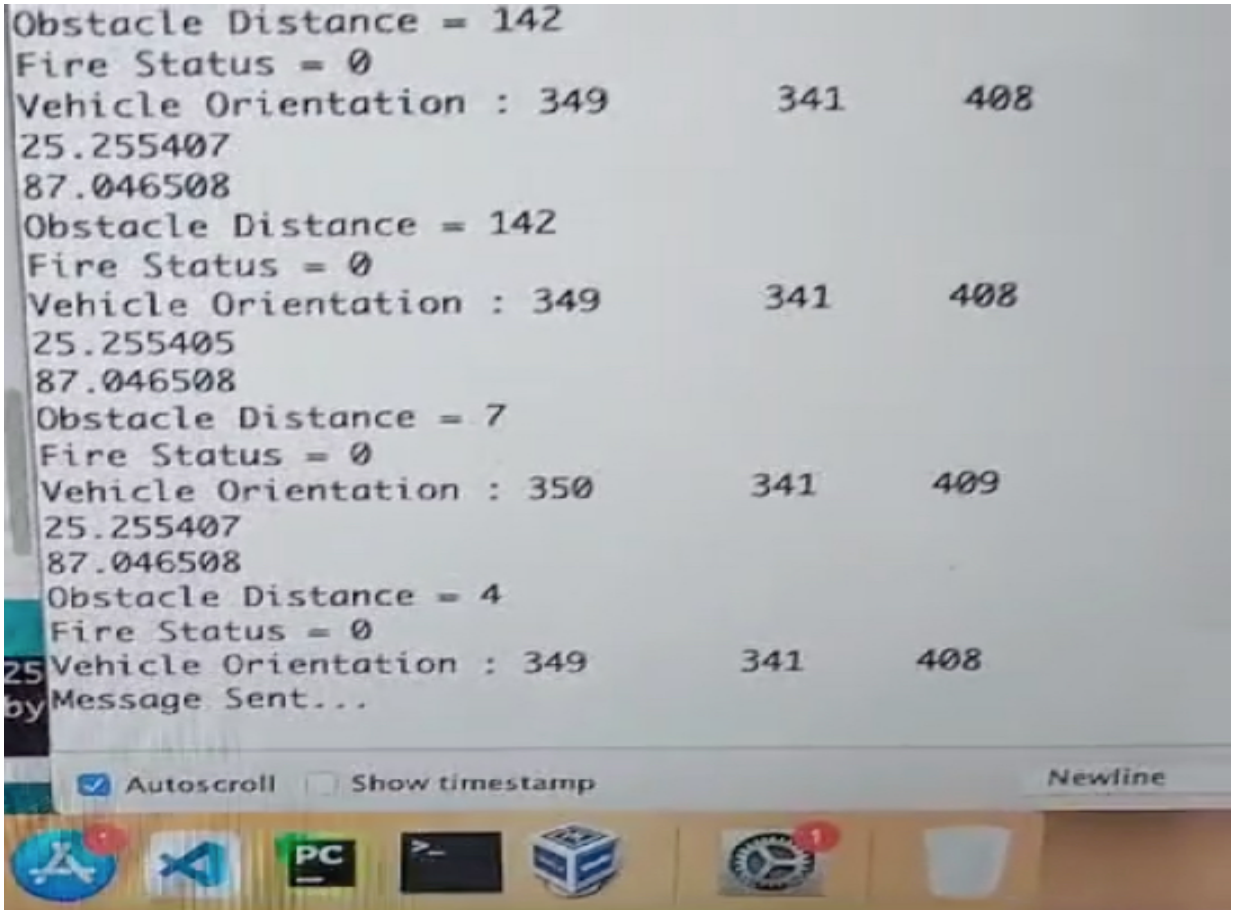
Result and Discussion

5.1 Introduction

This chapter contains the results obtained and discussion about the full project. We have also covered discussions about advantages, limitation, application and estimated cost of the current version of the vehicle accident detection.

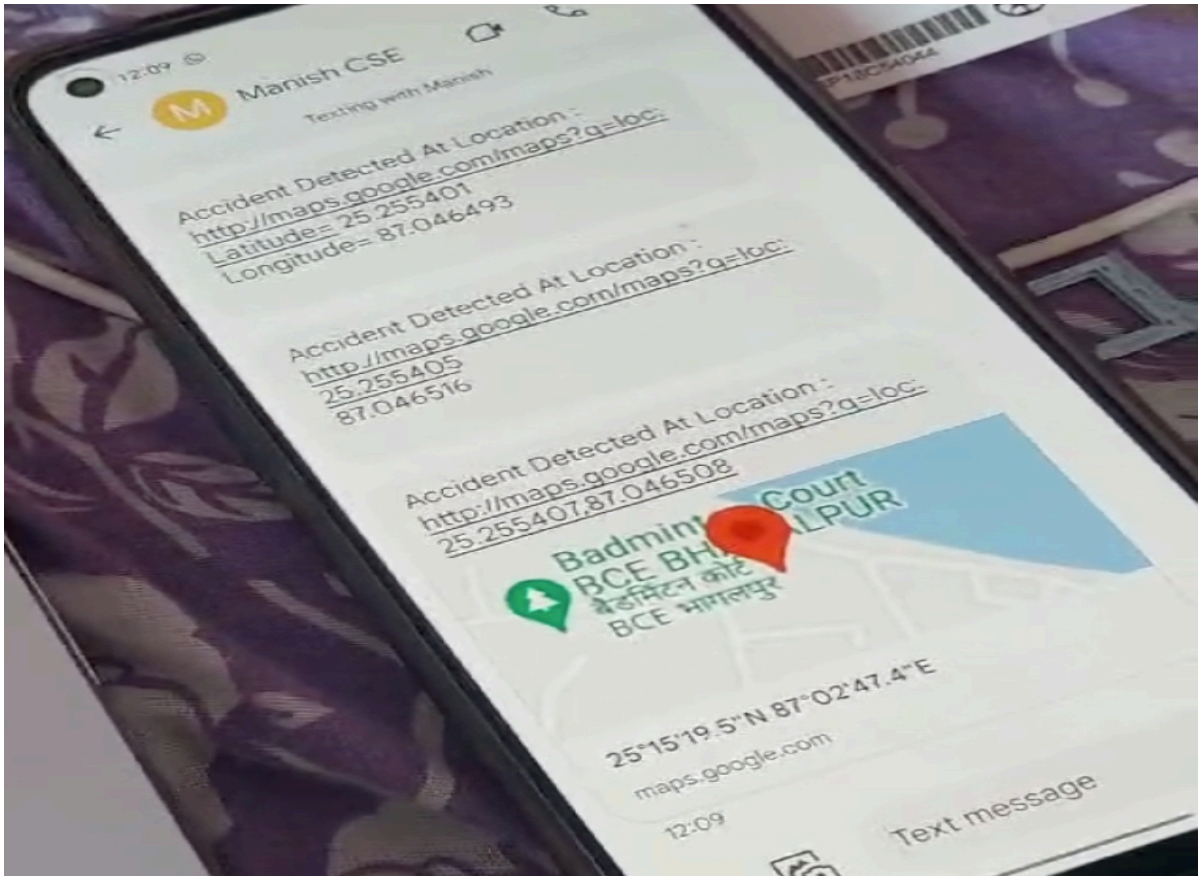
5.2 Results and Discussions

The results include the successful operation of an automatic accident detection and notification systems. This system can detect the accident and then alert the nearest police station and medical assist center to provide emergency medical aid to accident victim.



GSM Module Working

GPS Module Working



5.4 Advantages of the System

- Portable and easy to use.
- It is easy to design and manufacture as all the components are easily available.
- It is portable and hence can be placed anywhere.
- Due to wireless communication data rate is faster.
- No need for lengthy wires.
- Easy to control
- Easy to maintain and repair
- Efficient and low-cost design
- Low power consumption
- The programming of the Arduino is easy.
- Can be modified easily.

5.5 Applications of the System

- It can be widely used in all types of vehicle for automatic accident detection and sending notification to the nearest police station and medical assist center.
- It can be used to track the stolen vehicle.

5.6 Estimated Cost of the System

SL.No.	Particulars	Quantity	Unit Price (in BDT)	Total Price (in BDT)
1	Arduino UNO	1	680	680
2	GPS Module(NEO-06M)	1	570	560
3	GSM Module(800L)	1	920	920
4	Acceleraometer	1	520	520
5	Fire Sensor	1	120	120
6	Ultrasonic sensor(SR04)	2	150	300
7	Pulse sensor	1	200	200
8	Jumper Wire and Adaptor	-	-	
Total (Three Thousand Six Hundred only)				3600

Chapter VI

Conclusion and Future Work

6.1 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. The proposed vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding accident. The system is successfully implemented and tested. After the detailed experiment, it is observed that this system is efficient and reliable.

6.2 Future Works

This system could be more reliable and useable if we develop or add some other features and systems. They are as follows:

- The Accident Alert System is a versatile system which can be modified to work with many other embedded circuits in vehicles to provide a number of applications.
- The Accident Alert System can be interfaced with the Air Bag system, which provides security to the driver in case of an accident.
- The circuit can be used for parking assistance in vehicles with slight modifications.
- A Proximity sensor can be added to the circuit, which would alert the driverby beeping a buzzer if the driver is about to collide with the vehicle in front.
- The presence of GSM modem makes it possible to track the vehicle in case of theft.
- The GPS modem makes it possible to make route navigation possible.
- A warning light or a loud horn can be interfaced with the circuit which is turned on in case of an accident, which draws the attention of the people nearby to the site of the accident.

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