Vehicle Accident Alert System

A Project Report
Submitted in partial fulfillment of the
Requirements for the award of the Degree of

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

By

Amrut D Parab (Seat No: 4021745)
Nilesh S Lad (Seat No: 4021641)

Under the esteemed guidance of
Ms. Shweta B Pawar
Assistant Professor

DEPARTMENT OF INFORMATION TECHNOLOGY
M V Mandali's Colleges of Commerce and Science
(Affiliated to University of Mumbai
ANDHERI WEST, MUMBAI – 400058
MAHARASHTRA
2019-20

M V MANDALI'S COLLEGES OF COMMERCE AND SCIENCE

MUMBAI- MAHARASHTRA-400058

(Affiliated to University of Mumbai)

DEPARTMENT OF INFORMATION TECHNOLOGY

CERTIFICATE

This is to certify that the project entitled, ___________________________________ _________________________________, undertaken by ______________________ ________________________ Seat No: _______ submitted in partial fulfilment of B.Sc. Information Technology Semester V examination has successfully completed the all the phases of the project from University of Mumbai during 2019-2020.

Internal Guide **External Examiner** **Co-ordinator**

Date: **Principal**

College Seal

PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the preform of approval should be filled up with appropriate and complete information. Incomplete preform of approval in any respect will be summarily rejected.)

PNR **No.: ……………………** Roll no**: _____________**

1. Name of the Student

____

2. Title of the Project

____

3. Name of the Guide

____

4. Teaching experience of the Guide ____

5. Is this your first submission? ☐ Yes No ☐

Signature of the Student Signature of the Guide

Date: ………………… Date: …………………

Signature of the Coordinator

Date: …………………

ABSTRACT

In highly populated Countries, everyday people lose their lives because of accidents and poor emergency facilities. These lives could have been saved if medical facilities are provided at the right time. This project implies a system which is a solution to this drawback, when a vehicle meets with an accident immediately a Vibration sensor will detect the signal, and sends it to the Arduino microcontroller. Microcontroller will send an alert message through the GSM modem including the location to the police station or a rescue team. So the police can immediately trace the location through the GPS modem after receiving the information. The proposed systems have been simulated and practically design by the use of hardware components and the results are satisfied with the expectation.

ACKNOWLEDGEMENT

I express my profound gratitude to my project guide Assistant Professor Shweta B Pawar for supporting me throughout the completion of this project. My special thanks to our respected Principal, Dr Gopal Kalkoti and our BSc IT Department Coordinator Assistant Professor Divyesh Nagrecha for their most sincere, useful and encouraging contribution throughout the preparation of this project.

I take this opportunity to express profound gratitude towards the management of M V Mandalis’s Colleges of Commerce and Science for giving me this opportunity to accomplish this project.

Finally I would like to thank all my friends and the entire BSc IT Department who have directly or indirectly assisted me in this project with their support, motivation and encouragement.

DECLARATION

I hereby declare that the project entitled, “**Vehicle Accident Alert System**” done at place where the project is done, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

TABLE OF CONTENT

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

With the growing population the use of vehicles has become superfluous and this has led to increase the traffic hazards and the road accidents, which causes huge loss of life because of the poor emergency facilities. The purpose of the project is to find the vehicle where it is and locate the vehicle by means of sending a message using a system which is placed inside of vehicle system, Most of the times we may not be able to find accident location because we don't know where accident will happen. When a vehicle meets with an accident immediately Vibration sensor will detect the signal, and sends it to Arduino microcontroller. Microcontroller sends the alert message through the GSM modem including the location to the police station or a rescue team. So the police can immediately trace the location through the GPS modem after receiving the information.

At present criteria, we cannot detect where the accident has occurred and hence no information related to it, leading to the death of an individuals. The research work is going on for tracking the position of the vehicle. In this project GPS is used for tracking the position of the vehicle, GSM is used for sending alert message. To make this process all the control is made using Arduino whereas LCD is used to display the accident information. Hence with this project implementation we can detect the position of the vehicle where the accident has occurred so that we can provide the first aid as early as possible.

1.2 Objectives.

The main objective of the project is:-

1. To detect the vehicle accident and transmit the location of the accident to the rescue team and police center, so will get the exact location by the geographical coordinates transmitted via message with the help of map.
2. To minimizing the delay of ambulance to save the injured.
3. Interface impact sensor with a GPS device, and carry out experiments by initiating impacts that will generate electronic signals to be transmitted to a GPS device.
4. Configure GPS device to integrate digital impact signal with GPS location data and transmit the resultant raw data to a database server through GSM.
5. Develop a web accessible database and interface software that will automatically receive and update data transmitted from GPS devices through wireless network, and also with a provision for manual update from authorized users.

1.3 PURPOSE, SCOPE AND APPLICABILITY.

1.3.1 Purpose.

The main purpose of the project is:-

1. To Provides security against theft.
2. To Monitors hazards and threats.
3. To Alerts police and medical units about accidents.
4. To provide stable and accurate positioning of car accident even in severe urban environments.
5. It saves the precious time required to save the accident victims.

1.3.2 Scope.

The main scope of the project is:-

1. To decrease the death of the rider.
2. To save the rider and to give the medical help ASAP.
3. To inform family & nearest hospital for help.
4. Simple and reliable design, so any rider can use.

1.3.3 Applicability.

The project accident detection location using GPS can also use in the following:-

1. **Stolen Vehicle Recovery**: In case of theft, the vehicle can be tracked by using vehicle positioning system. The GPS system allows the tracking of vehicle from anywhere.
2. **Airbag System:** This system can be interfaced with vehicle airbag system for safety. When an accident occurs both the systems will be activated for the safety of the victim.
3. **Bomb Detection:** This system can be used for bomb detection by connecting it to a bomb detector. The buzzer can be used to alert the presence of a bomb in the vehicle.
4. **Fleet Management:** When managing a fleet of vehicles, knowing the real-time location of all drivers allows management to meet customer needs more efficiently. Whether it is delivery, service or other multi-vehicle enterprises, drivers now only need a mobile phone with telephony or Internet connection to be inexpensively tracked by and dispatched efficiently.

1.4 Definitions of important terms.

1. **Vehicle impact sensors** - These are very small devices fitted in a motor vehicle to detect collision and physical damage.
2. **Electronic Control Unit (ECU)** - This is a crash sensor Electronic Control Unit which is central to all the sensors in a vehicle. It receives, and process electronic analog or digital signals received from the sensors. Based on the magnitude of the signals received, it makes decision whether to undertake certain action. For example it may deploy airbag, and in the case of the proposed project it will transmit a digital message to the GPS device to the effect that an accident has occurred.
3. **Global Position System** - Is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there

is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver with some technical limitations which are only removed for authorized users

Global System for Mobile Communication (GSM) - is a digital mobile telephony system that is widely used in Europe and other parts of the world GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

4. **General Packet Radio Service (GPRS)** - is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM) GPRS was originally standardized by European Telecommunications Standards Institute (ETSI) in response to the earlier packet switched cellular technologies It is now maintained by the 3rd Generation Partnership Project (3GPP) GPRS usage is charged based on volume of data. This contrasts with circuit switching data, which is typically billed per minute of connection time, regardless of whether or not the user transfers data during that period.
5. **Multiplexer** - A device that receives numerous signals in parallel and present them serially to the ECU in an orderly fashion because the ECU can only process one signal at a time.
6. **Technometer** - Wheel speed sensor.
7. **Trilateration** - A process in geometry of determining absolute or relative locations of points by measurement of distances, using the geometry of circles, spheres or triangles In addition to its interest as a geometric problem, trilateration does have practical applications in surveying and navigation, including global positioning systems (GPS). In contrast to triangulation it does not involve the measurement of angles.

CHAPTER 2

SURVEY OF TECHNOLOGIES

2.1 LITERATURE SURVEY

2.1.1 Arduino.

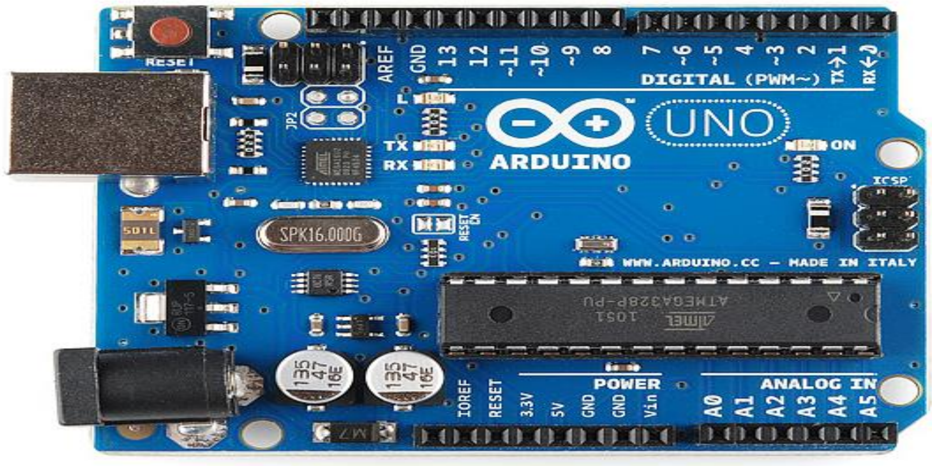


Figure 1: Arduino UNO

An Arduino is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005. Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

7 Reasons why Arduino is being preferred these days:-

1. It is inexpensive
2. It comes with an open source hardware feature which enables users to develop their own kit using already available one as a reference source.
3. The Arduino software is compatible with all types of operating systems like Windows, Linux, and Macintosh etc.
4. It also comes with open source software feature which enables experienced software developers to use the Arduino code to merge with the existing programming language libraries and can be extended and modified.
5. It is easy to use for beginners.
6. We can develop an Arduino based project which can be completely stand alone or projects which involve direct communication with the software loaded in the computer.
7. It comes with an easy provision of connecting with the CPU of the computer using serial communication over USB as it contains built in power and reset circuitry.

2.1.2 Atmega 328.

The Atmel ATmega48/88/328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega48/88/328 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

The Atmel ATmega48/88/328 provides the following features: 4K/8K/16K bytes of In-System Programmable Flash with Read-While-Write capabilities, 256/512/512 bytes EEPROM, 512/1K/1K bytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte-oriented 2-wire Serial Interface, an SPI serial port, a 6-channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable Watchdog Timer with internal Oscillator, and five software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, USART, 2-wire Serial Interface, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption.

The ATmega48, ATmega88 and ATmega328 differ only in memory sizes, boot loader support, and interrupt vector sizes. Table 2-1 summarizes the different memory and interrupts vector sizes for the three devices.

Device	Flash	EEPROM	RAM	Interrupt vector size
ATmega48	4Kbytes	256Bytes	512Bytes	1 instruction word/vector
ATmega88	8Kbytes	512Bytes	1Kbytes	1 instruction word/vector
ATmega168	16Kbytes	512Bytes	1Kbytes	2 instruction words/vector

ATmega88 and ATmega328 support a real Read-While-Write Self-Programming mechanism. There is a separate Boot Loader Section, and the SPM instruction can only execute from there. In ATmega48, there is no Read-While-Write support and no separate Boot Loader Section. The SPM instruction can execute from the entire Flash.

2.1.3 GPS Modem.

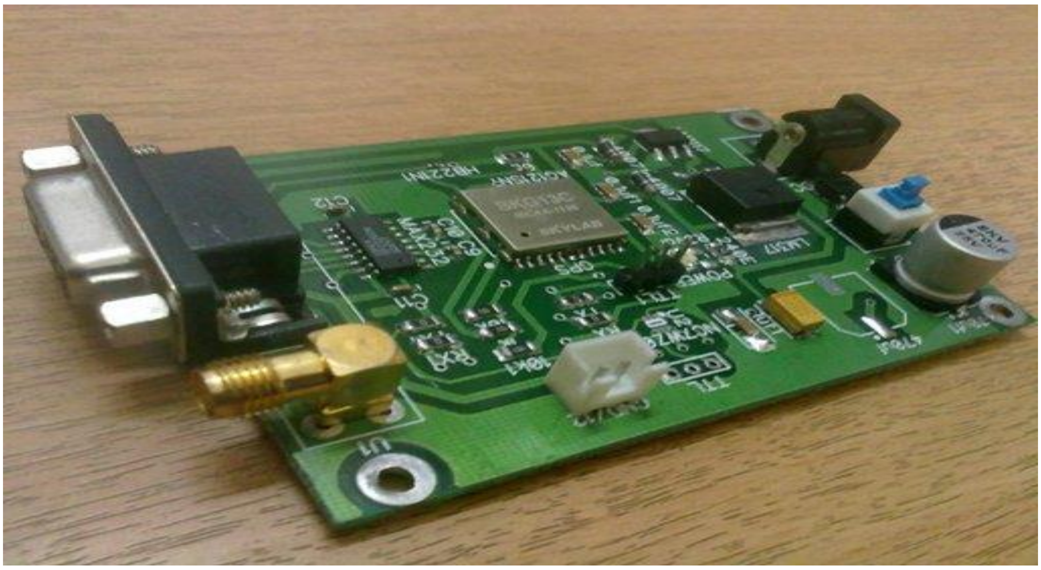


Figure 2: GPS MODEM

The SkyNav SKG11B is a complete GPS engine module that features super sensitivity, ultra low power and small form factor. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol. It is based on the high performance features of the Media Tek 3329 single-chip architecture, Media Tek newest chipset technology. Its –163dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs, mobile phones, cameras and vehicle navigation systems.

2.1.4 GSM Modem.

GSM (Global System for Mobile Communications) is the most popular standard for mobile telephony systems in the world. GSM is used by over 1.5 billion people across more than 212 countries and territories. Its ubiquity enables international roaming arrangements between mobile network operators, providing subscribers the use of their phones in many parts of the world. GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a second generation (2G) mobile phone system.

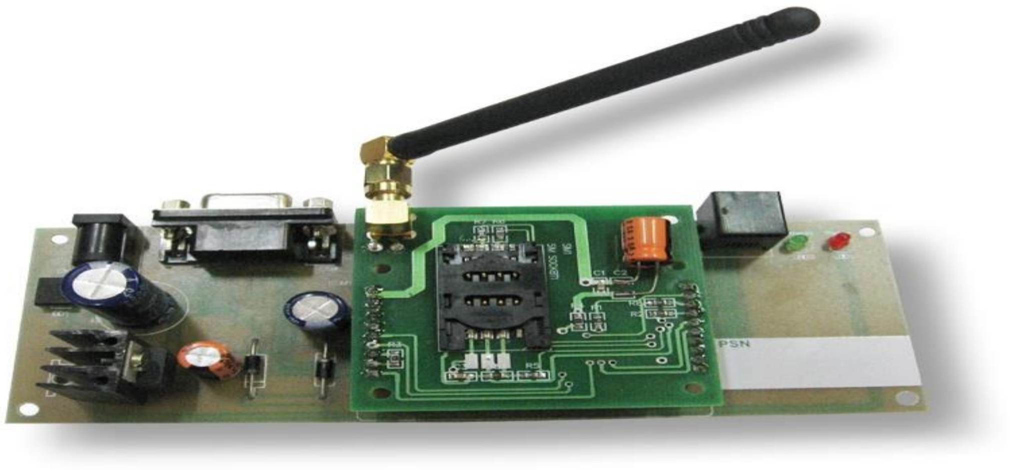


Figure 3: GSM MODEM

This also facilitates the wide-spread implementation of data communication applications into the system. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, which has since been supported on other mobile phone standards as well. The standard includes a worldwide emergency telephone number feature. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, pico, femto and umbrella cells. The coverage area of each cell varies according to the implementation environment.

2.1.5 LM 35 - Temperature sensor.

The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical o/p comparative to the temperature (in °C). It can measure temperature more correctly compare with a thermistor. This sensor generates a high output voltage than thermocouples and may not need that the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.

Temperature sensors directly connected to microprocessor input and thus capable of direct and reliable communication with microprocessors. The sensor unit can communicate effectively with low-cost processors without the need of A/D converters.

The LM35 does not need any exterior calibration and maintains an exactness of +/-0.4°C at room temperature and +/-0.8°Cover a range of 0°C to +100°C.One more significant characteristic of this sensor is that it draws just 60 micro amps from its supply and acquires a low self-heating capacity. The LM35 temperature sensor available in many different packages like T0-46 metal can transistor-like package, TO-92 plastic transistor-like package, 8-lead surface mount SO-8 small outline package

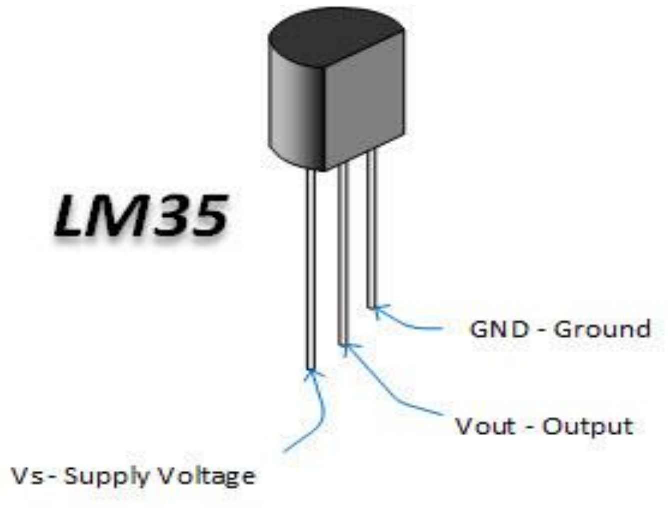


Figure 4: Temperature Sensor - LM35

Vcc - Input voltage is +5V for typical applications

Analog Out - There will be the increase in 10mV for raise of every 1°C. Can range from -1V(-55°C) to 6V(150°C)

Ground - Connected to ground terminal of the circuit

An example for a temperature sensor is LM35. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius temperature. The LM35 is operates at -55˚ to +120˚C.

2.1.6 Resistor.

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$$V = IR$$

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

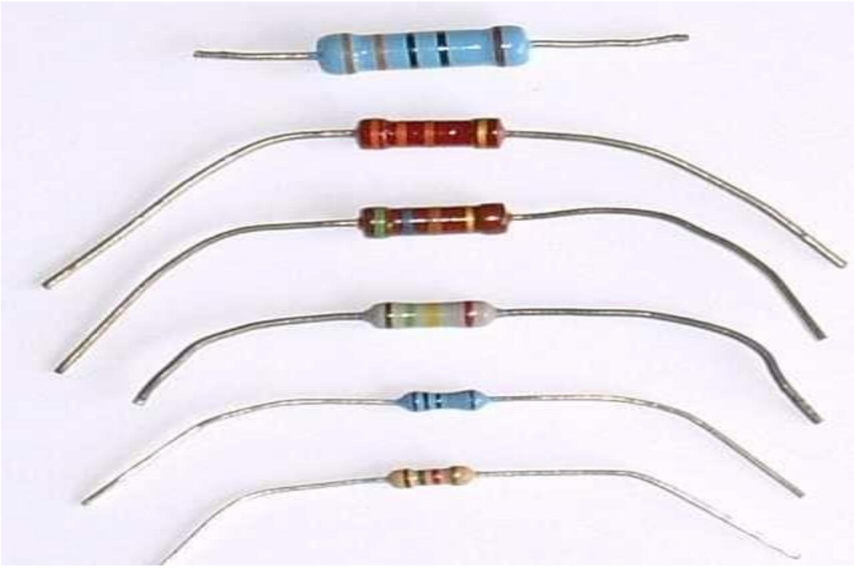


Figure 5: Registers

The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.

Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

2.1.7 Liquid Crystal Display (LCD)

Figure 6: LCD - Liquid Crystal Display

Frequently, an 8051 program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an 8051 is an LCD display. Some of the most common LCDs connected to the 8051 are 16x2 and 20x4 displays. This means 16 characters per line by 2 lines and 20 characters per line by 4 lines, respectively.

Fortunately, a very popular standard exists which allows us to communicate with the vast majority of LCDs regardless of their manufacturer. The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (in this case, the 8051) and communicates directly with the LCD.

2.1.8 Light Emitting Diode (LED)

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. When a light-emitting diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is often small in area (less than 1 mm2), and integrated optical components may be used to shape its radiation pattern. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability.

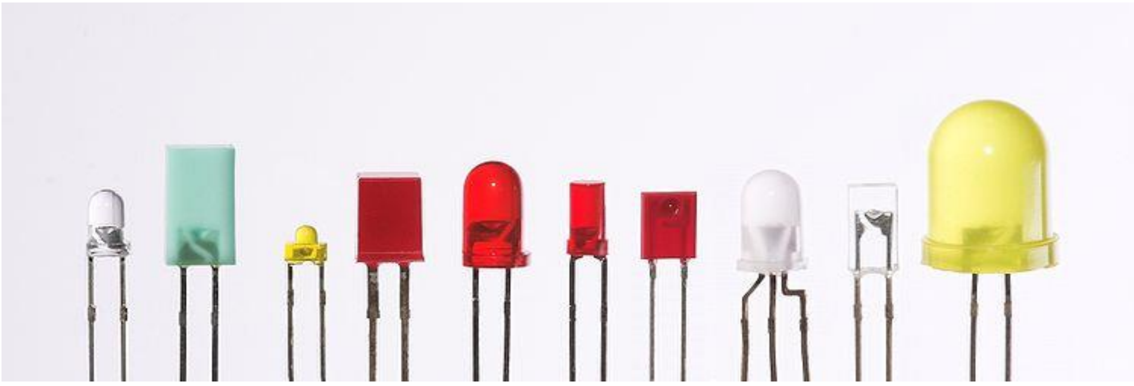


Figure 7: LED - Light Emitting Diode

Light-emitting diodes are used in applications as diverse as replacements for aviation lighting, automotive lighting as well as in traffic signals. The compact size, the possibility of narrow bandwidth, switching speed, and extreme reliability of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are also useful in advanced communications technology.

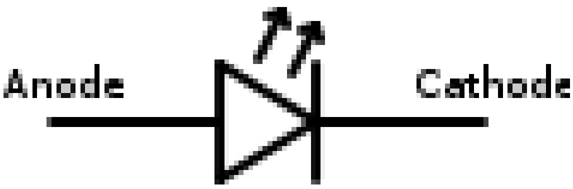


Figure 8: Electronic Symbol of LED

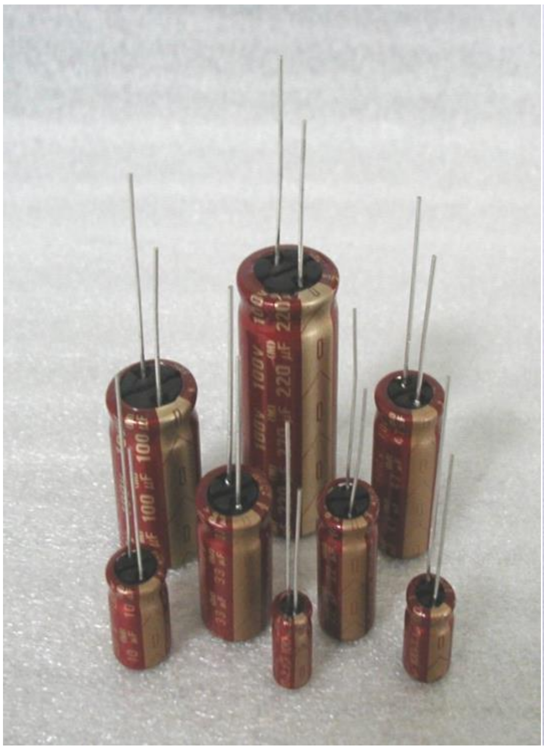
2.1.9 Capacitor.

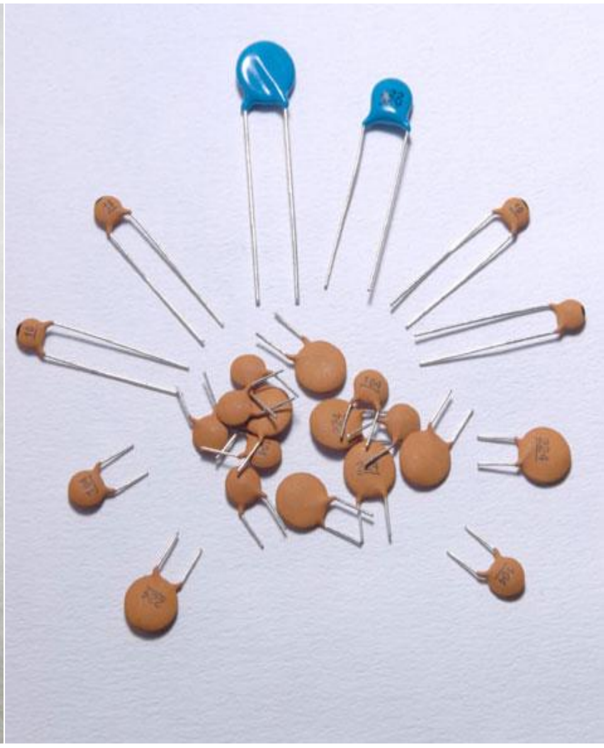
A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage.

The properties of capacitors in a circuit may determine the resonant frequency and quality factor of a resonant circuit, power dissipation and operating frequency in a digital logic circuit, energy capacity in a high-power system, and many other important aspects.

A capacitor (formerly known as condenser) is a device for storing electric charge. The forms of practical capacitors vary widely, but all contain at least two conductors separated by a non-conductor. Capacitors used as parts of electrical systems, for example, consist of metal foils separated by a layer of iinsulatinfilm.





2.1.10 Push button

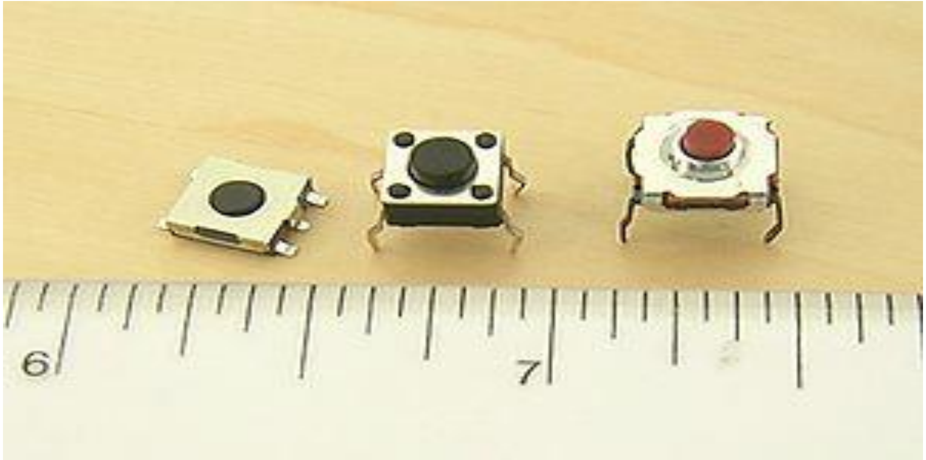


Figure 9: Push Button

A push-button or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons (due to their physical nature) require a spring to return to their un-pushed state. Different people use different terms for the "pushing" of the button, such as press, depress, mash, and punch.

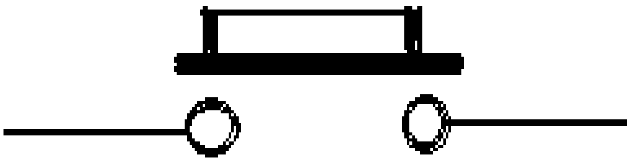


Figure 10: Push to ON button

Initially the two contacts of the button are open. When the button is pressed they become connected. This makes the switching operation using the push button.

2.1.11 Vibration Sensor.

Figure 11 : Vibration sensor

Here a simple Vibration sensor to protect door or window is used. It generates a loud beep when somebody tries to break the door or window. The alarm stops automatically after three minutes. The circuit uses a piezoelectric element as the vibration sensor. It exploits the piezoelectric property of the piezo electric crystals. The piezoelectric effect may be direct piezoelectric effect in which the electric charge develops as a result of the mechanical stressor or indirect piezoelectric effect (Converse piezoelectric effect) in which a mechanical force such as vibration develops due to the application of an electric field.

CHAPTER 3

REQUIREMENTS AND ANALYSIS

3.1 Planning and Scheduling.

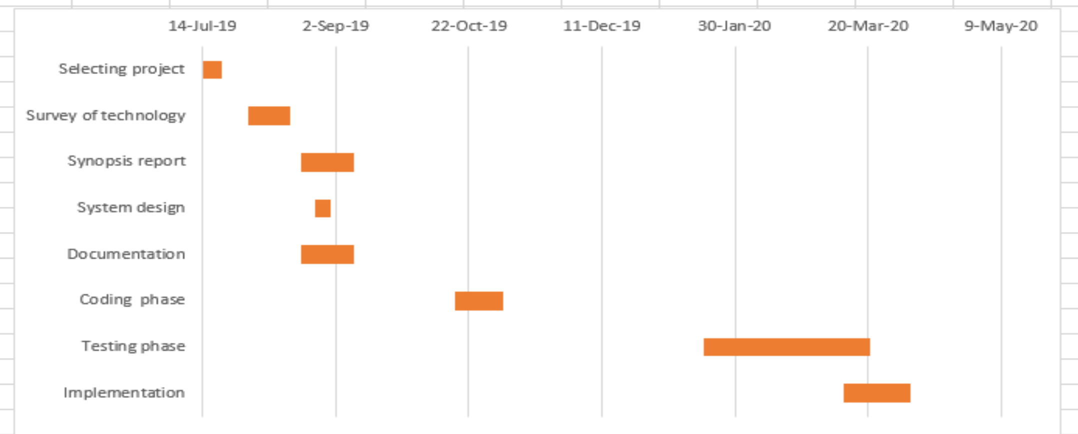
3.1.1Gantt chart

A Gantt chart, or harmonogram, is a type of bar chart that illustrates a project schedule. This chart lists the tasks to be performed on the vertical axis, and time intervals on the horizontal axis. The width of the horizontal bars in the graph shows the duration of each activity. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements constitute the work breakdown structure of the project. Modern Gantt charts also show the dependency (i.e., precedence network) relationships between activities. Gantt charts can be used to show current schedule status using percent-complete shadings and a vertical "TODAY" line as shown here.

Gantt charts are sometimes equated with bar charts.

Gantt charts are usually created initially using an *early start time approach*, where each task is scheduled to start immediately when its prerequisites are complete. This method maximizes the float time available for all tasks.

	A	B	C	D	E	F
1	Task Name	Start Date	End Date	Duration		
2	Selecting project	7-Jul-19	14-Jul-19	7		
3	Survey of technology	15-Jul-19	31-Jul-19	16		
4	Synopsis report	1-Aug-19	20-Aug-19	20		
5	System design	21-Aug-19	25-Aug-19	6		
6	Documentation	31-Aug-19	20-Aug-19	20		
7	Coding phase	29-Sep-19	17-Oct-19	18		
8	Testing phase	16-Nov-19	18-Jan-20	63		
9	Implementation	14-Feb-20	11-Mar-20	25		
10						



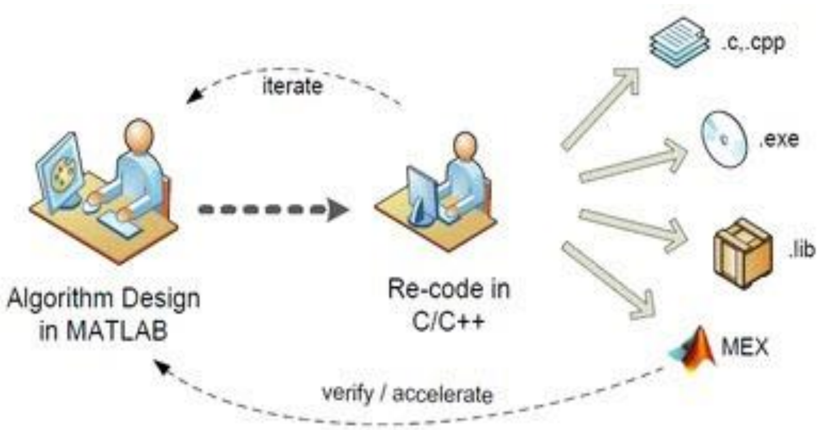
3.2 Software and Hardware Requirements

3.2.1 SOFTWARE REQUIREMENTS

EMBEDDED C LANGUAGE

Embedded C Programming is the soul of the processor functioning inside each and every embedded system we come across in our daily life, such as electronic machines, processors, etc.

Each processor is associated with an embedded software. The first and foremost thing is the embedded software that decides functioning of the embedded system. Embedded C language is most frequently used to program the microcontroller.



Earlier, many embedded applications were developed using assembly level programming. However, they did not provide portability. This disadvantage was overcome by the advent of various high level languages like C, Pascal, and COBOL. However, it was the C language that got extensive acceptance for embedded systems, and it continues to do so. The C code written is more reliable, scalable, and portable; and in fact, much easier to understand.

3.2.2 Hardware requirements.

1. Arduino
2. ATMEGA 328.
3. GPS Modem.
4. GSM Modem.
5. LM 35 - Temperature Sensors.
6. Resistor.
7. Liquid Crystal Display (LCD).
8. Light-emitting diode (LED).
9. Capacitor.
10. Push Button.
11. Vibration Sensor.

3.3 Use case diagram.

A **use case diagram** at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use case in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses

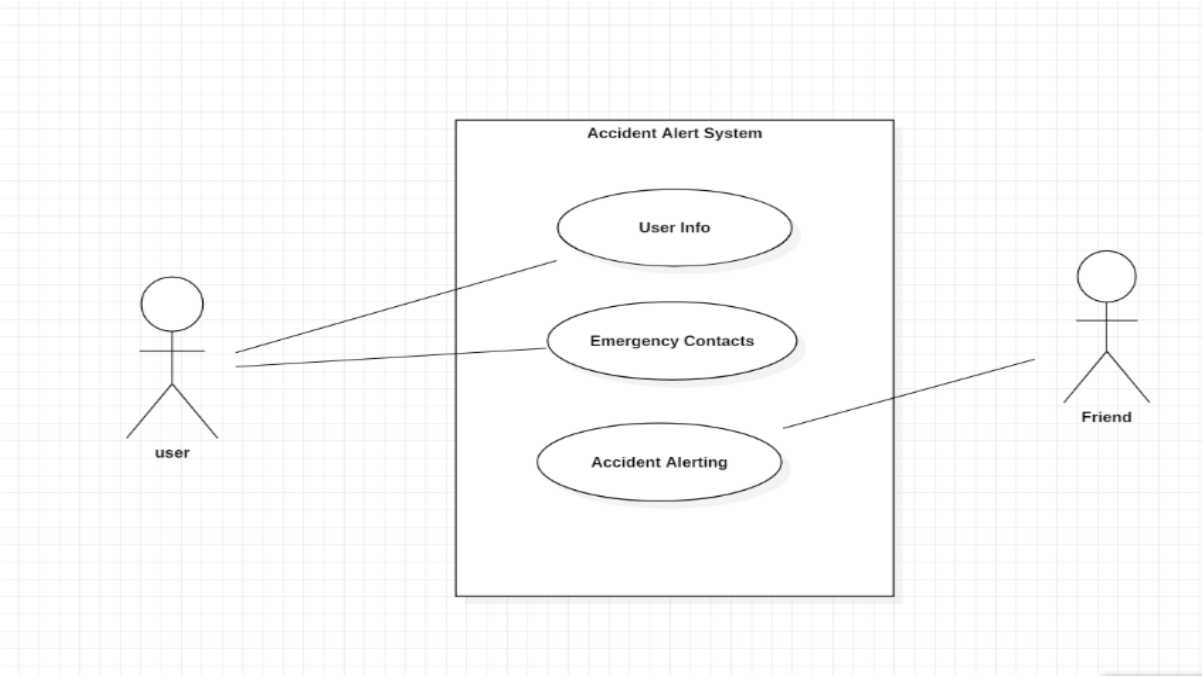


Figure 12 : Use case diagram

3.4 System Block Diagram.

Here in the system block diagram shown in below figure, Arduino is used as main microcontroller, this system is made for accident alert ,the whole system is to be implemented in the vehicle itself. So ,when the accident happens , the vibration sense the shock and send it to an Arduino microcontroller , at the same time , with GPS the latitude and longitude of that particular location is obtained, And with that the exact location of the accident site is determined. And here, GSM modem SIM900 is interfaced with microcontroller. So that, when accident happens, the SMS will be sending automatically to the particular numbers which would be entered in the database. LCD will display the shock intensity and the validity of sending message. Also display the delay time to give the person chance to press the key if the accident is normal.

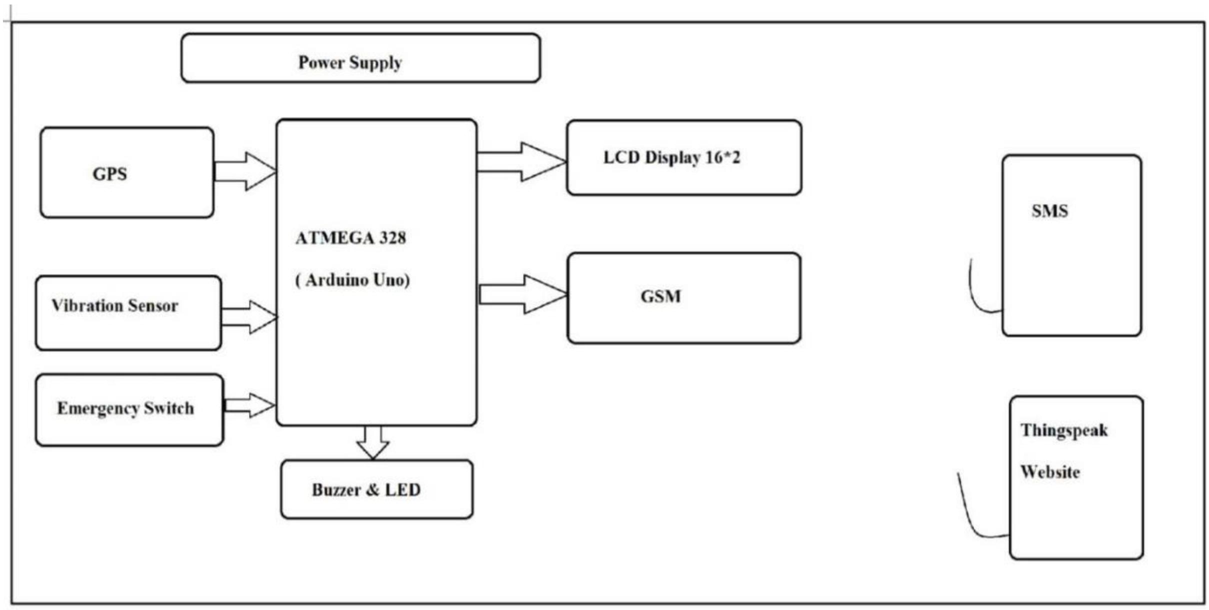


Figure 13 : Block diagram

CHAPTER 4

SYSTEM DESIGN

4.1 ER diagram.

An entity-relationship diagram (ERD) is a data modeling technique that graphically illustrates an information system's entities and the relationships between those entities.An ERD is a conceptual and representational model of data used to represent the entity framework infrastructure.

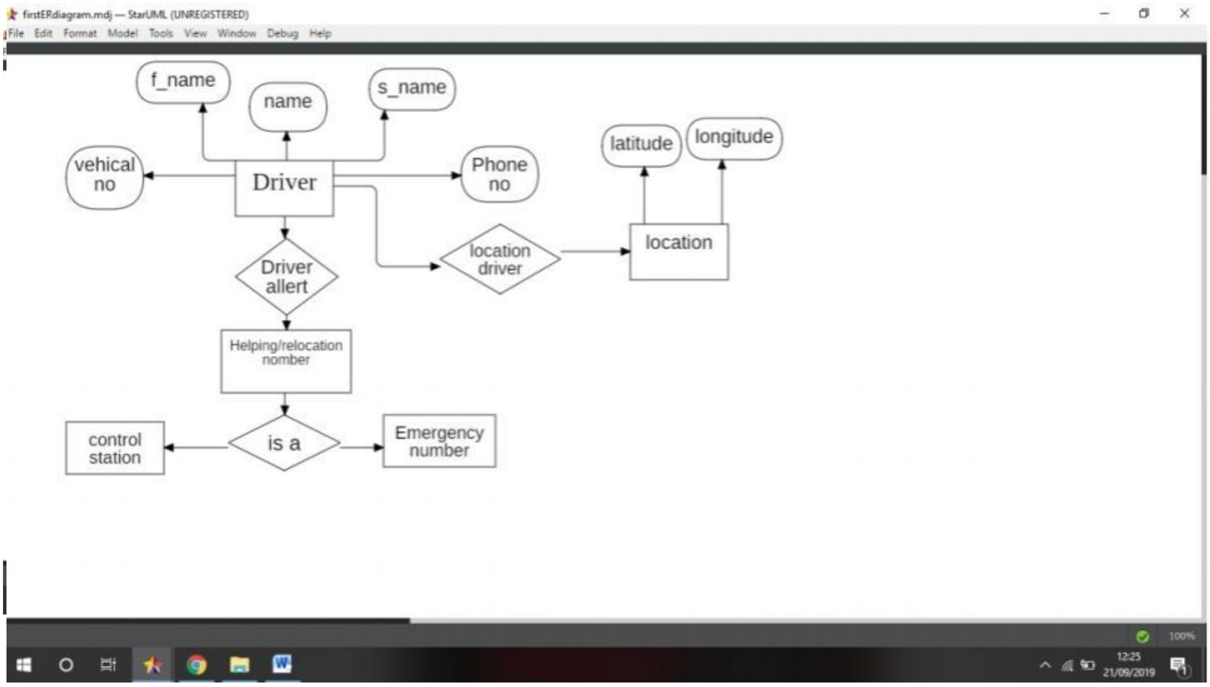


Figure 14 : ER Diagram

4.2 Flow chart.

A **flowchart** is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task.

The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.

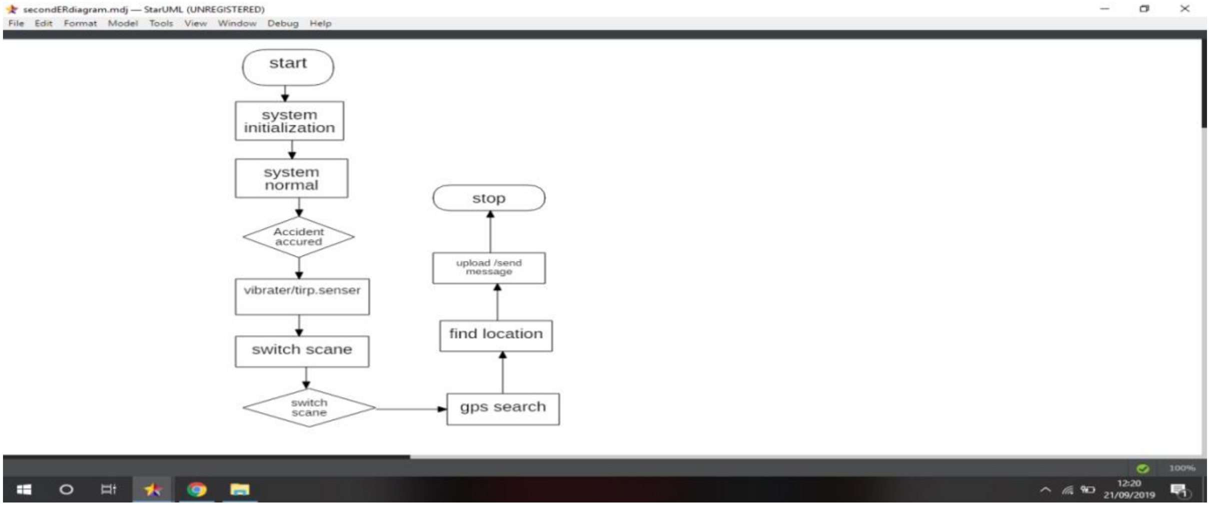


Figure 15 : Flow Chart

4.3 ALGORITHM.

An algorithm (pronounced AL-go-rith-um) is a procedure or formula for solving a problem, based on conducting a sequence of specified actions. A computer program can be viewed as an elaborate algorithm. In mathematics and computer science, an algorithm usually means a small procedure that solves a recurrent problem.

Algorithms are widely used throughout all areas of IT (information technology). A search engine algorithm, for example, takes search strings of keywords and operators as input, searches its associated database for relevant web pages, and returns results.

Step 1: Start

Step 2: Vehicle starts and the system get initialize.

Step 3: If system is normal then go to step 1 or continue to step 4.

Step 4: Accident occurred.

Step 5: Vibrator and Temperature sensors get trigger.

Step 6: Switch get scan of vibrator and Temperature sensors.

Step 7: The temperature of car engine is high.

OR

The car impact to a harder object.

Step 8: Message get typed.

Step 9: GPS module get trigger and search the GPS.

Step 10: Get the exact location with the help of GPS.

Step 11: Send the message to the rescue team and relatives and Update the data on the server.

Step 12: Stop.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Testing.

In testing, the objective was to determine if the system achieved the requirements as previously specified. Testing started early in the development of the system, but thoroughly carried out after the development of the entire system Both the hardware and software elements of the prototype were tested as detailed in the following subsections.

5.1.1 Hardware testing.

The Detection module

Impacts were initiated against the impact sensors. Impacts with magnitudes less than the pre-set threshold for an accident were not transmitted beyond the ECU (electronic control unit) device. This test was significant in that small vehicle impacts are not accidents and should not be reported as so. The impact sensors in the prototype returned positive results in these tests.

The Tracking Module

The GPS device was tested to :-

i. See if it could receive GPS satellite signals and generate spatial or location data for the accident scene.
ii. To establish that it could receive impact signal from the impact detection module in the prototype.
iii. To determine if it could integrate the spatial and impact data relating to a specific accident and / transmit the same to a remote database using wireless GSM network The testes returned positive results according to the laid down requirements.

The Surveillance Module

This module was tested to the :-

i. Confirm if the GSM phone could receive from the GPS device the complete accident data.
ii. Determine if the GSM Phone could link appropriately with the computer server hosting the accident database and transmit the data received from the GPS to the database.
iii. Establish that the hosting computer could function as a database and web server. The memory, speed, monitor resolution of the computer and other features were tested The computer’s ability to link with a network in order to provide server services to clients accessing the accident database was also tested.

5.1.2 Software Testing.

The software in this system was subjected to various tests to determine that set requirements were met. The various types of tests carried out are as below:

i. Module or Unit Testing

A module in this system was seen as a collection of executable program statements that can be called from any other module in the program and has the potential of being independently compiled. Module testing involved testing each individual module or subprogram in the system. In cases where the modules contradicted the system internal specifications, corrections were done on the design, and code Much of the modules testing was conducted during the system development using test cases designed using both the white and black box techniques.

ii. Integration Testing

Also called interface testing, was conducted to verify that the merging modules could work correctly as a whole without contradicting the systems internal and external specifications. This test was done using test cases designed using both the white and black box techniques.

iii. System Testing

System testing was conducted to verify that the integrated system (as a whole) was structurally and functionally sound, to attain the system objectives System test was done using test cases designed using black box technique. The tests as specified below were conducted as adapted from Eldon Y. L. 1990.

Structural system tests carried out included:-

- Compliance test - To check if the system was developed in accordance with standards and procedures.
- Configuration test - To check if the system could work under minimum and maximum configurations.
- Documentation test - To check if the user documentation is accurate
- Maintainability test - To check if the system is easy to maintain and that the internal logic documentation is accurate
- Operations test - Can the system be executed in a normal operational status?
- Performance test - Does the system achieve desired levels of performance or efficiency under certain workload and configuration conditions?
- Portability test - Is the system compatible, installable and maintainable?
- Recovery test - Can the system be returned to an operational status after a failure?
- Reliability test - Does the system meet the reliability objective?
- Security test - Is the system protected in accordance with its level of importance?
- Storage test - Does the system have enough main and secondary storage?

Functionality tests carried out included:-

- Auditability test - Does the system provide audit trails and meet other auditing standards?

- Control test - Do the controls reduce system risk to an acceptable level?
- Error-handling test - Can errors be prevented or detected and then corrected9
- Inter-systems test - Can data be correctly passed from one system to another9
- Manual support test - Does the people-computer interaction work?
- Parallel test - Are there unplanned differences between the old and the new systems?
- Requirements test - Does the system perform as specified?
- Usability test - Are the system and documentation user-friendly?

iv. Installation Testing

The objective of this test was to find installation errors. Test cases checked to ensure that the compatible set of system options has been selected by the user, that all parts of the system exist, that all software modules have been properly interconnected, that all files have been created and have the necessary contents and that the hardware configuration is appropriate This test was done using test cases designed using black box technique.

v. Software Acceptance testing

This test was carried out to ensure that the software system meet known system external specifications, and acceptance criteria. The system was executed in as near the user's operational environment and host computer configuration as possible. This test was done using test cases designed using black box technique.

5.2 Test Case Design Technique.

For each of testing, test cases were designed. The following techniques for designing test cases were used:-

i. White-Box technique (also called structured, code based, or logic driven) required the examining of the internal structure of the system and derive the test cases and data from the program logic described in the system internal specifications (SIS), of the program source code.
ii. Black-Box technique (also called functional, data driven or input/output technique) did not require the tester to know the internal structure of the system. The test cases and data were derived solely from the system requirements definition or the system external specifications (SES).

5.3 Coding Details and Code Efficiency.

Code written to the processor

```
#include<stdio.h>

#include<stdlib.h>

#define LCD_RS 3

#define LCD_RW 1
```

```
#define LCD_EN 2
/*----4x20 lcd display functions prototypes declarations--*/
void lcdinit(void);
void lcdcmd(char);
void lcddata(char);
void lcdstring(char*);
void lcdline1(void);
void lcdline2(void);
void lcdline3(void);
void lcdline4(void);
void clearscreen(void);
void gsmlink(void);
void sms_send(void);
void disp_gpsdata(void);
void gps_check(void);
/*----serial communication functions prototypes declarations---*/
void USART_Init(void);
void USART_Transmit(unsigned char data );
void usart_puts(char *ptr);
void delay(unsigned char del);
/*----globlal variables declarations----*/
int i,k=0;
char d[75],start=0,rmcok=0,disp;
char gpsdata,cnt;
/*.......main function.............*/
int main(void)
{
DDRA =0xff;
DDRC =0xff;
```

```
DDRB =0xff;
DDRD =0xff;
lcdinit();
clearscreen();
lcdstring("VEHICLE TRACKING");
lcdline2();
lcdstring("USING GPS & GSM");
_delay_ms(1000);
clearscreen();
USART_Init();
_delay_ms(500);
gsmlink();
_delay_ms(1000);
lcdline1();
lcdstring("GSM initilizing");
_delay_ms(1000);
/*usart_puts("AT+CMGS=");
USART_Transmit(0x22);
usart_puts("8985754202");
USART_Transmit(0x22);
USART_Transmit(0x0d);
 usart_puts("TIME:");
USART_Transmit(0x1A); */
k=0;
while(1)
{
disp_gpsdata();
if(cnt==10)
{
```

```
SREG = 0x00;
cnt=0;
//sms_send();
SREG = 0x80;
}
}
return(0);
}
/*........lcd initialization function............*/
void lcdinit(void)
{
lcdcmd(0x30);
lcdcmd(0x38);
lcdcmd(0x06);
lcdcmd(0x0c);
lcdcmd(0x01);
lcdcmd(0x80);
}
/*.......lcd command function....gpsmil.................*/
void lcdcmd(char cmd)
{
_delay_ms(20);
PORTA =cmd;
cbi(PORTB,LCD_RS);
cbi(PORTB,LCD_RW);
sbi(PORTB,LCD_EN);
_delay_us(10);
cbi(PORTB,LCD_EN);
}
```

```
/*.......lcd data function.......gpsmil.................*/
void lcddata(char dat)
{
_delay_ms(20);
PORTA =dat;
sbi(PORTB,LCD_RS);
cbi(PORTB,LCD_RW);
sbi(PORTB,LCD_EN);
_delay_us(10);
cbi(PORTB,LCD_EN);
}
/*****************************/
void lcdstring(char *str)
{
while(*str)
{
lcddata(*str);
str++;
}
}
/*..........lcd display routine function..........*/
void lcdline1(void)
{
lcdcmd(0x80);
}
void lcdline2(void)
{
lcdcmd(0xc0);
}
```

```
void lcdline3(void)
{
lcdcmd(0x94);
}
void lcdline4(void)
{
lcdcmd(0xd4);
}
void clearscreen(void)
{
lcdcmd(0x01);
}
void delay(unsigned char del)
{
int i;
for (i=0;i<del;i++)
_delay_ms(100);
}
/**********************************************************/
/************gps data receive program******************/
void USART_Init()
{
UCSRB=0x98;
UCSRC=0x06;
UBRRL=0x67;
UBRRH=0x00;
sei();
}
/*************************/
```

```
ISR(USART_RXC_vect)
{
 gpsdata = UDR; // Fetch the recieved byte value into the variable "ByteReceived"
 gps_check();
 if(rmcok==1)
{
 d[k]=gpsdata;
 k++;
 if(k==60)
 {
rmcok=0;
 disp=1;
 }
 }
 }
void usart_ puts(char *ptr)
{
while(*ptr)
{
USART _Transmit(*ptr);
ptr++;
}
i=0;
}
/***************************/
void USART_Transmit( unsigned char data )
{
while ( !( UCSRA & (1<<UDRE)) );
UDR = data;
```

```
}
/*******************************************************/
void disp_gpsdata(void)
{
_delay_ms(100);
clearscreen();
if(disp==1)
{
//cli();
disp=0;
SREG = 0x00;
_delay_ms(1000);
/* //lcdline1();
// lcdstring("TIME:"); //hrs
for(k=5;k<=6;k++)
{
//lcddata(d[k]);
}
//lcdstring(":");
for(k=7;k<=8;k++)
{
//lcddata(d[k]);
}
//lcdstring(":");
for(k=9;k<=10;k++)
{
//lcddata(d[k]);
}*/
lcdline1();
```

```
lcdstring("LON:");
for(k=17;k<=27;k++)
{
lcddata(d[k]);
}
lcdline2();
lcdstring("LAT:");
for(k=29;k<=40;k++)
{
lcddata(d[k]);
}
//lcdline4();
//lcdstring("DATE:");
for(k=50;k<=55;k++)
{
//lcddata(d[k]);
}
cnt++; //sei();
_delay_ms(1000);
k=0;
_delay_ms(1000);
_delay_ms(1000);
_delay_ms(1000);
sms_send();
SREG = 0x80;
}
}
/***********************************/
void gps_check(void)
```

```
{
 if(gpsdata=='R')
{
d[k]=gpsdata;
k++;
}
if( (d[0]=='R')&( gpsdata=='M'))
{
d[k]=gpsdata;
k++;
}
if((d[0]=='R')&(d[1]=='M')& (gpsdata=='C'))
{
d[k]=gpsdata;
k++;
rmcok=1;
}
}
/****************linking GSM to AVr*****************************/
void gsmlink(void)
{
usart_puts("AT"); USART_Transmit(0x0D); _delay_ms(20);
clearscreen();lcdline1(); lcdstring("AT");

usart_puts("ATE0"); USART_Transmit(0x0D); _delay_ms(20);
 clearscreen();lcdline1(); lcdstring("ATE0");
usart_puts("AT+CSMS=0"); USART_Transmit(0x0D); _delay_ms(20);
 clearscreen();lcdline1(); lcdstring("AT+CSMS=0");
usart_puts("AT+IPR=9600"); USART_Transmit(0x0D); _delay_ms(20);
```

```
 clearscreen();lcdline1(); lcdstring("AT+IPR=9600");
usart_puts("AT+CMGF=1"); USART_Transmit(0x0D); _delay_ms(20);
 clearscreen();lcdline1(); lcdstring("AT+CMGF=1");
usart_puts("AT&W"); USART_Transmit(0x0D); _delay_ms(20);
 clearscreen();lcdline1(); lcdstring("AT&W");
usart_puts("AT+CNMI=2,1,0,0,0"); USART_Transmit(0x0D); _delay_ms(20);
 clearscreen();lcdline1(); lcdstring("AT+CNMI=2,1,0,0,0");
}
/******************SIM DETAILS******************************/
void sms_send(void)
{
i=0;
k=0;
usart_puts("AT+CMGS=");
USART_Transmit(0x22);
usart_puts("8985754202");
USART_Transmit(0x22);
USART_Transmit(0x0d);
usart_puts("TIME:"); //hrs
for(k=5;k<=6;k++)
 {
USART_Transmit(d[k]);
 }

 USART_Transmit(0x3a); //min
for(k=7;k<=8;k++)
 {
 USART_Transmit(d[k]);
 }
```

```
USART_Transmit(0x3a); //sec
for(k=9;k<=10;k++)
{
USART_Transmit(d[k]);
}
USART_Transmit(0x0D);
usart_puts("LONGITUDE:");
USART_Transmit(0x0D);
for(k=17;k<=27;k++)
{
USART_Transmit(d[k]);
}
USART_Transmit(0x0D);
usart_puts("LATITUDE:");
USART_Transmit(0x0D);
for(k=29;k<=40;k++)
{
USART_Transmit(d[k]);
}
USART_Transmit(0x0D);
usart_puts("DATE:");
USART_Transmit(0x0D);
for(k=53;k<=58;k++)
{
USART_Transmit(d[k]);
}
USART_Transmit(0x1A);
clearscreen();
lcdstring(" MSG SENT");
```

```
 k=0;
}
```

CHAPTER 6

RESULTS AND DISCUSSION

6.1 Results.

The system detects accident from a vehicle and send message through GSM module. The message is received by another GSM module. GPS Module track the exact location of the accident, Hence there is small variation in the coordinates, initial value of latitude and longitude are same but fractional value changes with small difference. At the simulation we tread the GPS and GSM modules with Virtual terminal, it act same as the modules work with more efficient at PROTEUS program. We connect the vibration sensor in the simulation with a variable resistance to control vibrate level. At hardware we built, Arduino receive analog signals from the vibration sensor , it display on the LCD , We set a certain limit for the amount of vibration if the shock exceed the limit then a delay of 10 second will display at the LCD and start count down to 0 , we introduced a key that will abort sending message if the key have been pressed before counting down finish , GPS will send the coordinates to microcontroller , GSM will send a message to the recorded numbers , the full system is shown below.

Message for accident :
“Accident alert
latitude: 2400.0090,
N longitude:
12100.0000, E time:
12:00”
This system shows the location of vehicle on the lcd connected to it also just to make sure the working condition of the microcontroller.

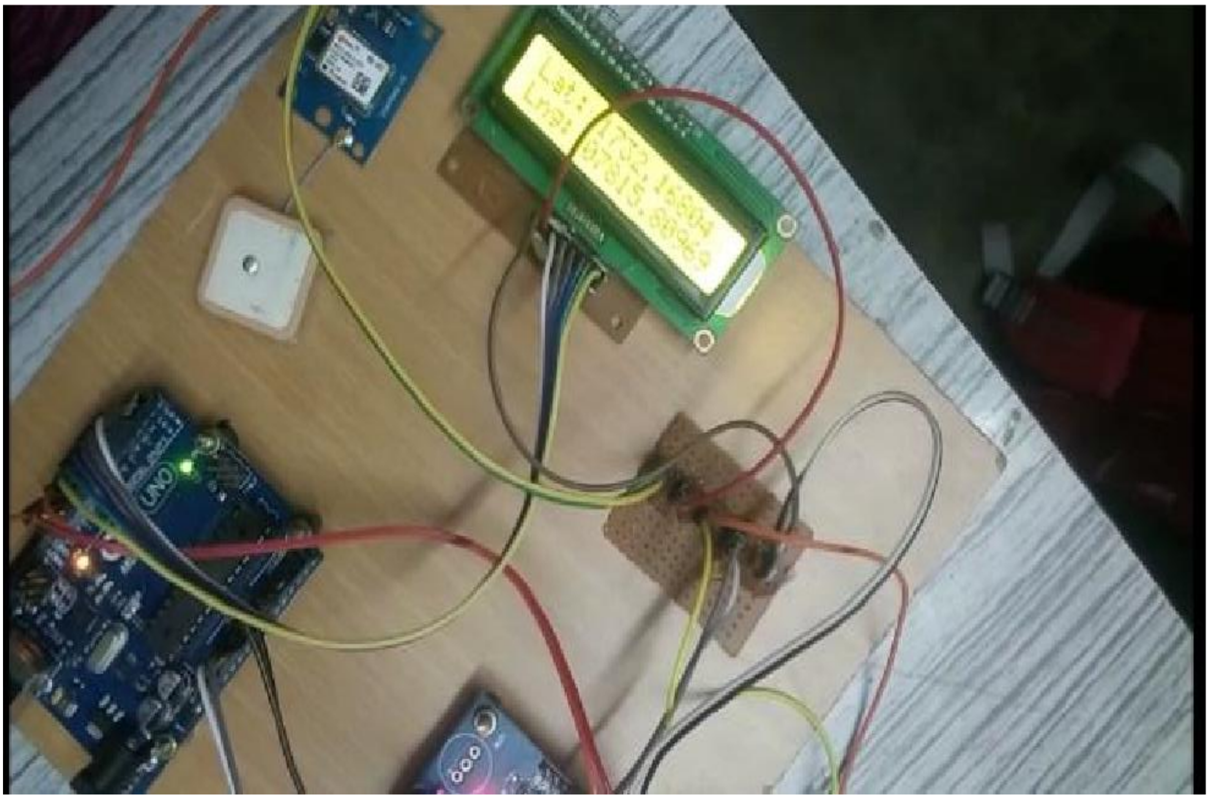


Figure 16: Output displayed on lcd

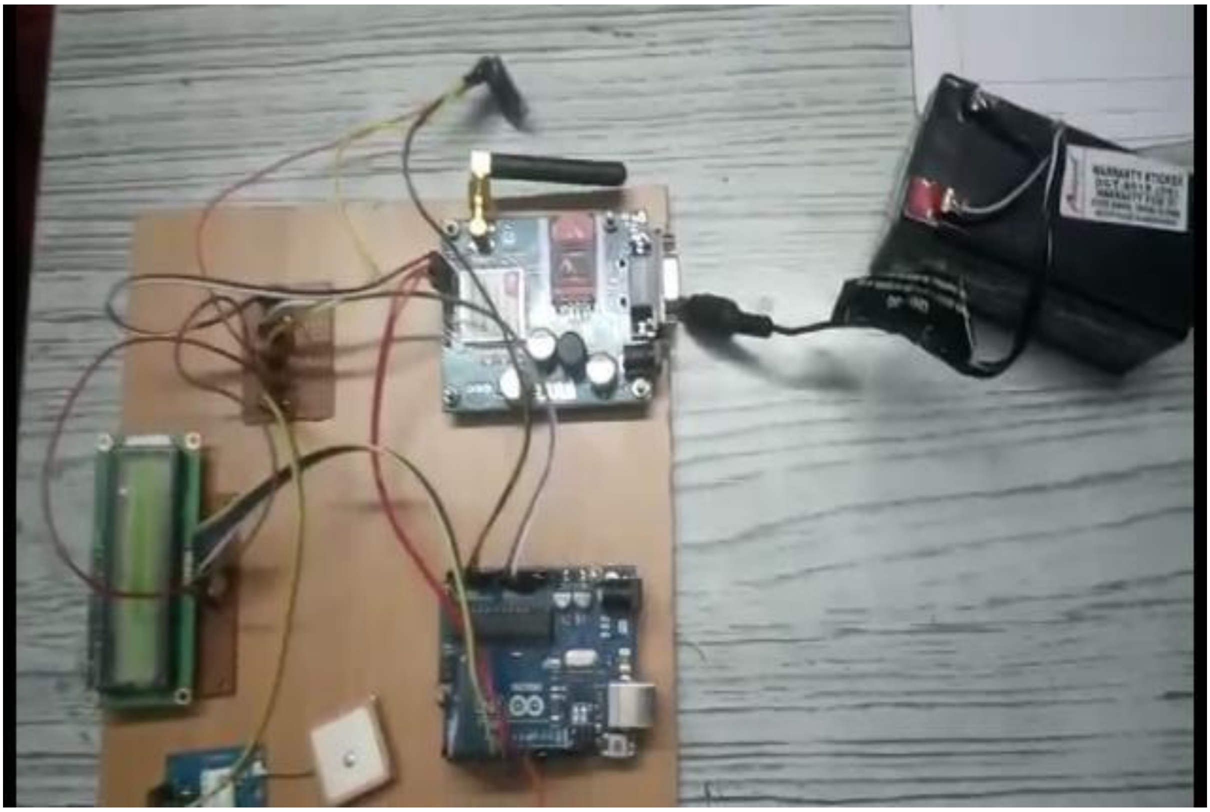


Figure 17: Accident detection system.

6.2 Test case.

CASE 1: When the car collides with any object with great impact - In this case the car is travelling with an average speed and then collides with another object with great impact, the resultant output would be that an accident has been detected and the alarm begins to ring for 30 seconds. If the alarm is turned off before the timer goes off i.e. the traveller is safe and does not need emergency services. Hence the SMS won't be sent to the emergency services. Otherwise the SMS will be sent to the Emergency services for help.

CASE 2: When the car experiences collision from the sides or back - In this case the car is travelling or is at halt and experiences a collision from the sides or back of the car. If the collision is with great impact i.e. higher than the threshold value ,the alarm begins to ring. If the alarm is not turned off, emergency services are contacted through SMS.

CASE 3: When the car collides with any object but with less force - In this case the Car is travelling with an average speed and then collides with another object with less force/impact. The impact experienced by the car is very less i-e less than the threshold value for an accident to be detected. Hence no accident is detected.

CASE 4: When the car rolls over in an accident - In this case the car while travelling meets with an accident in such a way that it experiences a roll over. The orientation of the car changes along with an impact experienced on it.Hence an accident is detected. This is assumed to be a critical situation, therefore no alarm will ring and the message to the emergency contacts and services will be sent for immediate help without wasting a second.

CASE 5: When the car experiences sudden deceleration - In this case, when driver of the car suddenly applies brakes, the car experiences a drop in acceleration. Since no impact or roll over is detected, we can conclude that no accident has occurred.

CASE 6: When the car is travelling at an elevated path - In this case, the car is travelling on an elevated platform. Example - Hilly areas, where the roads are steep and the car makes certain angle with the ground. This changes the orientation of the car but accident is not detected.

CHAPTER 7

CONCLUSIONS

7.1 Conclusion.

Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

Main motto of the accident alert system project is to decrease the chances of losing life in such accident which we can't stop from occurring. Whenever accident is alerted the paramedics are reached to the particular location to increase the chances of life. This device invention is much more useful for the accidents occurring in deserted places and midnights. This vehicle tracking and accident alert feature plays much more important role in day to day life in future. In my thesis I have developed a vehicle tracking system that is flexible, customizable and accurate. The GSM modem was configured and I tested and implemented the tracking system to monitor the vehicle's location via SMS and online on Google map. To display the position on Google map I have used Google map API. The microcontroller is the brain of the system and the GSM modem is controlled by AT commands that enable data transmission over GSM network while the GPS provide the location data. Whenever the GPS receives a new data it is updated in the database and hence the location is viewed on Google map. The system provides accurate data in real time that makes it possible for the user to track the vehicle and it also enables an early retrieval if the car is stolen. This thesis has widely increased my knowledge of GPS and also improved my programming.

The proposed system is developed to provide the information about the accident occur and the location of the accident .It helps to easily provide the assistant and help to the victim of the accident. This system uses GPS module to locate the vehicle. GSM is used to provide the information of accident. The results of the proposed systems are satisfactory.

7.2 Limitations of the System.

While this advanced technology based tracking system can benefit users, company or any organization, there are also some limitations to using this vehicle tracking devices. Often GPS takes time to connect with the network due to poor weather conditions. For the GPS to work properly, it needs to have a clear view of the sky. That is it is unlikely to work indoor or may even have problem outside where it has no clear path of transmitting to and receiving signal from satellites. Therefore, due to obstacles like tall buildings or such infrastructure which block view of the sky, often causes multipath error to the receiving signal of the GPS receiver. As a result, location seems to appear to jump from one place to another leading to inaccurate results. Thus incorrect values of latitude and longitude are sent to the server, for displaying in the Google map on error being initialized.

7.3 Future Scope of the Project.

We are finding the shortest path based on the distance of nearby hospitals but there may be chance that the traffic will be more in that path. So we need to come up with some algorithm which gets the nearby hospitals with minimal distance and traffic. We may add some modules which will also let the system know about the traffic details and then find out which node will take less time to reach from the accident spot. Another thing which we may add is „first aid kit‟ for emergency medical treatment at the scene itself. We can also add some modules which will measure the injuries level or some additional information like blood group, heart beats, current glucose level which may be be send to the hospitals in advance before the victims reaches the hospitals hence improvise the performance of the proposed system.

Further this system can be implemented by using sound sensor, in order to make it more accurate and efficient to detect an accident. This is extended with alcoholic detection also. If the person who is driving took alcohol then the vehicle will be stopped immediately by giving alarm. This can also be developed by interconnecting camera to the controller module that takes the photograph of the accident spot makes tracking easier.

We found the location of the accident but there may be chance that the traffic jam will be high in that path. So we need to come up with some algorithm which gets the nearby hospitals with minimal distance and traffic. We may add some modules which will also let the system know about the traffic details and then find out which node will take less time to reach from the accident spot.

REFERENCES

1) R S GAONKAR “Microprocessor architecture programming and Application” WILEY EASTER LTD, NEWDELHI.

2) KRISHNA KANT “Microprocessor and microcontroller” EASTER COMPANY EDITION NEW DELHI 2007.

3) DANIEL .W.LEWIS “Fundamental of embedded software” 2004.

4) WILLIAM STALLING “Wireless communication and Networks”, 2nd edition, 2005.

https://en.wikipedia.org/wiki/Global_Positioning_System

https://en.wikipedia.org/wiki/GSM

https://en.wikipedia.org/wiki/Arduino_Uno

https://en.wikipedia.org/wiki/ATmega328

https://en.wikipedia.org/wiki/Liquid-crystal_display

https://www.labcenter.com

https://www.8051projects.com

https://www.wikipedia.com

https://www.atmel.com

https://www.tatteleservices.com

https://www.roseindia.net

https://www.google.com

https://www.arduino.cc/en/main/software