JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Vehicle Accident Alert System Using GPS And GSM

Mr. Sudhir Shukla [1]Name of 1st Sudhir Kumar Sagar,[2]Name of 2nd Vinay Chaudhary,[3]Name of 3rd Ravindra Kumar,[4]Name of 4th Santosh

Department Of Electronics And Communication Engineering
Buddha Instiute Of Technology Gida Gorakhpur

Abstract : Today's world is moving in such a speed that no person can spare a minute to stop and look what is happening. The rapid increase in population has inevitably increased the number of vehicles on road and more road accidents with life-loss. The report from World Health Organization (WHO) revealed that approximately 1.35 million people are losing their life each year, because of road accidents. The major reason for accidents is due to drunken driving, distracted driving, over speeding etc. Also, nearly 55% of the life-loss in the highways occurs due to the negligence of accident report of the passer-by vehicles especially during the night or in deserted places remain unnoticed till dawn. A person surviving from the accident, tends to lose their life due to lack of immediate medical response. A Vehicle Accident Emergency Alert system is proposed for immediate attention which could save their life. As soon an accident occurs the vibration sensor or the accelerometer present in the system, transmits the signals to Arduino controller. Latitudes and longitudes data are collected from the GPS system, passed using the GSM module to the emergency centre, and sends a text message to all the people listed in the emergency List. Getting the exact location would help the ambulance to reach the spot with shortest route and time. The proposed alert system could be implemented with less cost and incorporated in all vehicles in near future so that the rate of life-loss could be minimized.

Index Terms - **Emergency alert, accelerometer, GSM module, Arduino.**

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 which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of both Micro electromechanical 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.

Hardware Requirements

I. Arduino UNO
II. Microcontroller (AT mega 328P)
III. GSM Module (SIM800L)
IV. GPS Module (NEO-6M)
V. Accelerator Sensor (ADXL335)
VI. Ultrasonic Sensor (HC-SR04)
VII. Vibration Sensor

1.Arduino UNO: -

Fig 1.1

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 antilog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without warring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards. 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. The Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

2.Microcontroller (ATMega328P):-

Fig 1.2

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has

- modified Harvard architecture 8-bit RISC processor core.

3.GSM Module (SIM800L

Fig 1.3

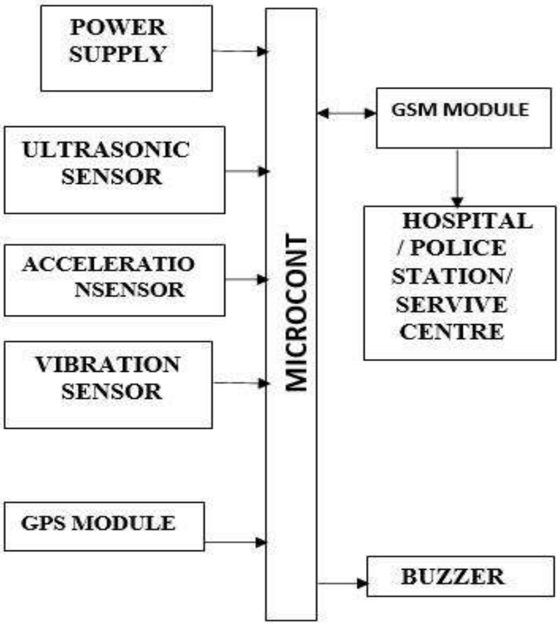
GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice 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.

4.GPS Module (NEO-6M)

Fig 1.4

The NEO-6 module series is a family of stand- alone GPS receivers featuring the high- performance u-box 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 Time To-First-Fix0(TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlates', is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppress jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments. For more details, check the datasheet here.



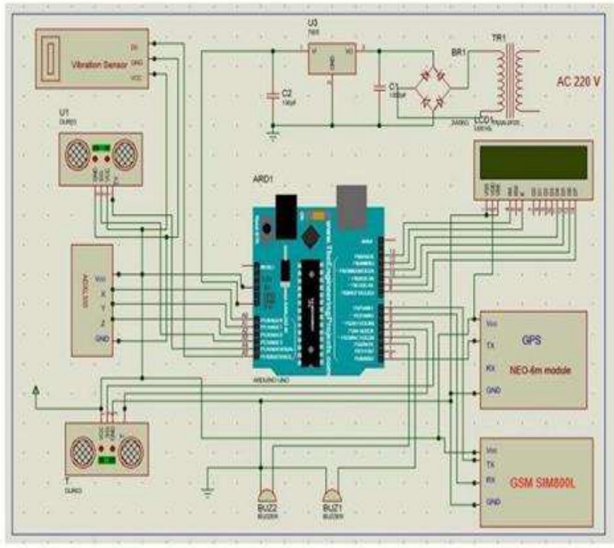


Fig 1.6 Circuit Diagram

Fig.1.5. Block Diagram of Vehicle Accident Detection

5. System Description:

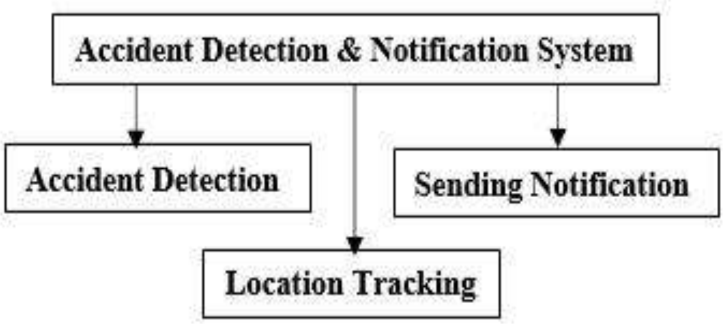


Fig.1.7 System Description Model

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 link Google 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.

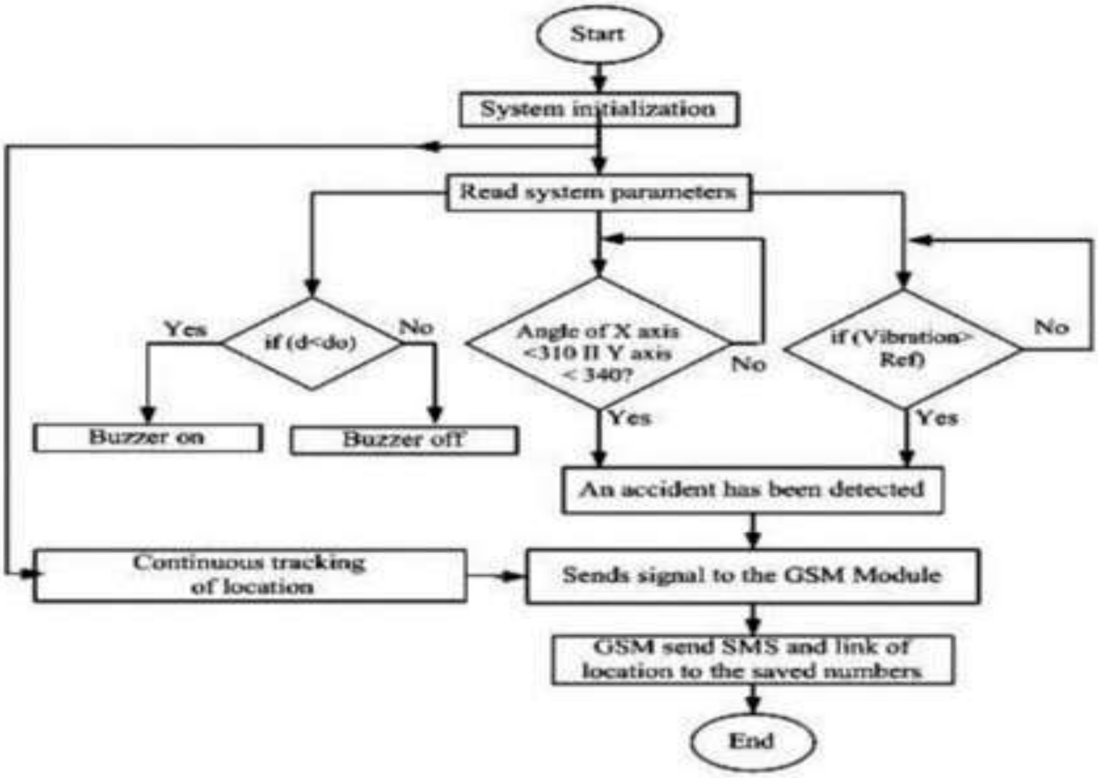


Fig 1.8 Flow Chart of The System

Description of Flow Chart:

First thing first, our system being started after that all of the mechanism will be initialized that means all the functionality is being started. After the initialization of the system, all of the sensor data will be collected. Here we used three different types of sensor, those are performed different task. First of all, the ultrasonic sensor get the object distance that come forward to the vehicle and buzzer will be on otherwise it will go back to the system. After that, our system will check that the vehicle is shake or not and it will measure by the accelerometer sensor. If the vehicle shakes much then the system makes sure that the accident is detected. After accident detection, our system will pass signal through the GSM module and GSM send SMS and the location where the accident occurs to the saved numbers. If not shake the system will follow normally. The vibration sensor response by any kind of stroke. If vehicle get stroke strongly, the vibration sensor makes sure that the accident occurred. Similarly, our system will generate signal and will pass through the GSM module and GSM send SMS and the location where the accident occurs to the saved number.

Advantages of the System:

TABLE I. Portable and easy to use.

TABLE II. It is easy to design and manufacture as all the components are easily available.

TABLE III. It is portable and hence can be placed anywhere.

TABLE IV. Due to wireless communication data rate is faster.
TABLE V. No need for lengthy wires.
TABLE VI. Easy to control
TABLE VII. Easy to maintain and repair
TABLE VIII. Efficient and low-cost design
TABLE IX. Low power consumption
TABLE X. The programming of the Arduino is easy.
TABLE XI. Can be modified easily

Limitations of the System:
It does not work without network.

Applications of the System

Fig. 1. 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 centre.

Fig. 2. It can be used to track the stolen vehicle.

3.RESULTS

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 centre to provide emergency medical aid to accident victim.

4.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.

5.FUTURE SCOPE

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 driver by 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.

6.ACKNOWLEDGEMENT

We would like to express our special thanks gratitude to Dr. D.S Bankar Head of department of electrical engineering for his valuable guidance and support for completing our research paper. I would also like to thank the faculty member of electrical department of electrical engineering who helped us with the extended support.

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