GSM based Vehicle Accident Alert System

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Abstract - One of the basic reasons for road accidents is speed. Road accidents are rising suddenly today and are one of the key causes of human deaths. Human life is more important than anything else, and timely assistance is more important than lending a helping hand. If emergency service could get accident reports and reach it in time, more lives could have been saved. In saving human lives, the time between the accident and when the ambulance reaches the site of the accident plays an important role. If we reduce the time between when an accident happens and when a medical ambulance is dispatched to the area, we can save human lives by reducing mortality rates. GPS has become an integral part of a vehicle system nowadays. The accelerometer senses a sudden shift in the vehicle's axles. It will be tested by Arduino. The Arduino sends the warning message via the GSM module to the police control room or a rescue team, including the location. So, after receiving the information, the police can automatically track the location via the GPS module. Then, the appropriate action will be taken after verifying the venue.

Keywords: **Accident alert system, Arduino UNO, GPS, GSM**

1. INTRODUCTION TO ACCIDENT ALERTING SYSTEM

The primary goal of the accident warning system is to save people in crashes. This device helps the owner to observe and find out vehicle activity and its past vehicle movements, the latest such as GPS are highly useful now-a-days.

Over the past decade, the use of auto mobiles has improved linearly, which increased the risk of human life. This is because the emergency services are inadequate. We use an alert system in this paper that helps to strengthen the emergency system of the crash system, [1].

This device senses the occurrence of the accident and the coordinated accident is reported to the emergency team. In the event of no causality, a switching mechanism is used to shut off. Using the Accelerometer Sensor, an accident is observed. The angle where the car rolled off is shown by a message, [2], [3]. This application aims to provide the weak emergency facilities with a suitable alternative.

This accident warning system identifies the accident and the location of the accident and sends GPS coordinates to the Smart Phone, device, etc. listed in it, [4].

2. PROBLEM IDENTIFICATION

An accident happens at night or in areas where no individuals are heard in that particular setting and victims are not saved at the right time.

Many of them are losing their lives because of this.

This device solves the above problem by submitting data directly after an accident to the emergency team.

3. PROPOSED SYSTEM

3.1 Objectives

1. To instantly rescue accident victims by sending a message to the rescue team with a MEMS accelerometer, GSM and GPS location.
2. Designing and implementing the notification mechanism for GSM.

3.2 Block diagram

The suggested work is based on the Arduino UNO, Accelerometer, GPS, GSM Sim800L Module, Cell Phone, Jumper wires, Power supply embedded device design circuit.

As the world population increases, time is needed for a large number of vehicles. With the rise in transportation rates, road accidents claim an incredibly high number of lives every year. Approximately 3,000 people die in road accidents every year, according to a WHO (World Health Organization) survey, while millions are injured or disabled every year.

The high demand for vehicles has also increased traffic hazards and people suffering from road accidents have increased. The shortage of emergency services available in our nation is one of the primary factors, [6], [7].

In most cases, when an accident happens, the families of the injured person receive the news of their accident not in time and the emergency response services reach the accident site late and the traffic between the accident location and the hospital also raises the risk of the victim's death, [5].

This project refers to the GSM-based SMS warning system of accident detection using Arduino.

It is possible to fit an accident warning device in the vehicle and they are told on the go about any such untoward incident.

As the system makes use of GPS and GSM technologies, accident detection and messaging system execution is easy.

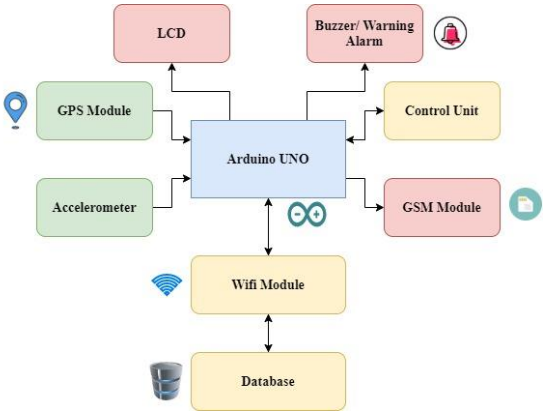
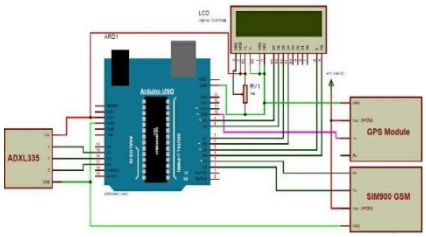


Figure 1 Block diagram of GSM based Accident detection System Using



Arduino

Figure 2 Circuit Diagram of GSM Based Accident Alerting System using Arduino

Circuit Diagram Description

- Circuit connections of this Vehicle Accident Alert System here The GPS module's TX pin is directly connected to the Arduino digital pin number 10. The GPS module is powered by a 3.3 volt supply.
- The Tx and Rx pins are directly related to Arduino pins D2 and D3.
- In this accident detection system, an Accelarometer is added and its x, y and z-axis ADC output pins are directly connected to Arduino ADC pins A1, A2, and A3.

3.4 Working Description

The Arduino controller used in this project is the controller that is used to control all the circuit modules. Two of the key sections of the circuit. The two key components other than the controller are the GPS module used as a receiver and GSM is another module.

The GPS module is used to receive the coordinates of the vehicle and GSM will send the received coordinates to the user via SMS. If a person driving the vehicle has an accident, the sudden change of information about the accelerometer axis sends to the Arduino and the location of the vehicle is sent to the GSM module and the vehicle coordinates are sent to the GSM module.

Figure 1 below specifies the operation of the GSM-based Arduino Accident Detection System.

The GSM module plays an important role in receiving the signal from the Arduino UNO in the above block diagram. When the power supply is supplied to the circuit until the Accelarometer sensor senses sudden axis shift, it sends the signal to the Arduino and the position of the vehicle obtained by the GPS module, and the vehicle coordinates are sent to the GSM module. The received data is gathered and sent via SMS to the valued individual.

3.3 Circuit Diagram

The circuit diagram of the GSM-based accident detection system using Arduino UNO is shown in figure 2.

The received information is collected and is send to the respected person through SMS.

4. HARDWARE REQUIREMENTS

The specifications in hardware and software are illustrated below:

1. Arduino UNO
2. Accelerometer
3. GPS
4. GSM Sim900A
5. Mobile phone

4.1 Arduino UNO

Figure 3 Arduino UNO

A microcontroller board based on the ATmega328P is the Arduino Uno. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB link, a power jack, an ICSP header and a reset button (of which 6 can be used as PWM outputs). Figure 3 shows the picture of Arduino UNO.

It contains everything you need to help the microcontroller; just plug it into a device with a USB cable or power it to get started with an AC to DC adapter or battery. It is a well-known open source microcontroller-based package that can communicate with LEDs, LCD screens, switches, buttons, motors, speakers and many more for the development of digital devices and interactive tools.

The Arduino system includes a set of digital and analog pins that can be inserted into several other boards and circuits that have different design functions. The Arduino board offers a serial USB communication interface to load machine codes. Arduino has developed its own Integrated Development Environment (IDE) software that fully supports C and C++ programs.

4.2 Accelerometer

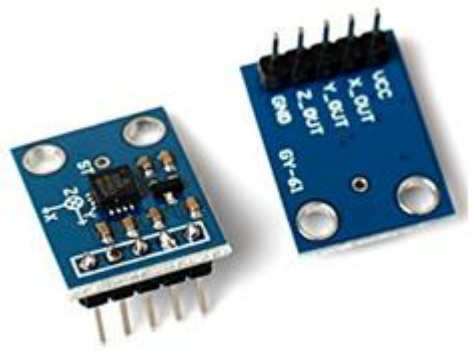


Figure 4 Accelerometer

This ADXL335 Accelerometer module consists of an integrated circuit ADXL335 Accelerometer IC, a Voltage Regulator IC, resistors and capacitors. A different voltage controller IC is used by various manufacturers. The XC6206P332MR (662K) IC is used in most of the modules. Figure 4 shows the image of Accelerometer sensor.

Analog Devices' ADXL335 IC is the brain behind this module. A lightweight, thin, low-power, maximum 3-axis accelerometer with signal-conditioned voltage outputs is the ADXL335. With a minimum full-scale range of ±3 g, the product tests acceleration.

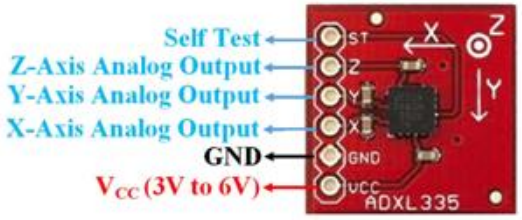


Figure 5 Pin Diagram of accelerometer

The Accelerometer module ADXL335 consists of six pins, i.e. VCC, GND, X, Y, Z, and ST. It's very simple to use the Accelerometer module with a microcontroller. Link the VCC and GND pins to the Microcontroller 5V and GND pins. Link the pins X, Y, and Z to the Arduino Analog pins as well. Figure 5 shows the pin configuration of accelerometer sensor.

The basic accelerometer structure consists of fixed plates and moving plates. Changes arise as acceleration is applied to the capacitance of the axis between fixed plates and moving plates. This results in voltage amplitude of the sensor output that is proportional to the acceleration.

4.3 GSM SIM800L Module

Global System for Mobile communication (GSM) is digital cellular system used for mobile devices.

Figure 6 GSM SIM800L module

The SIM800L is a miniature cellular module that enables GPRS transmission, SMS sending and receiving, and voice calls to be made and received. The low cost and small footprint and support for quad band frequency make this module the ideal solution for any project needing long-range connectivity. Figure 6 shows the image of GSM SIM800L module.

Check for the cellular network and login automatically after the power module link boots up. Link status on board LED displays.

There are two antennas included in this module. Second, wire (which solders directly to NET pin on PCB) is made of wire - very useful in narrow areas. Second - PCB antenna - with double-sided tape and IPX connector pigtail cable attached.

This one has better output and allows the module to be inside a metal case as long as the antenna is outside. It can communicate through AT commands with controllers (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands). The abbreviation for Attention is AT.

4.4 GPS Module

GPS receivers are commonly used for monitoring or finding position in Smart Phones, fleet management system, military etc. The Global Positioning System (GPS) is a satellite system used to measure and calculate the location of satellites and ground stations on Earth.

GPS is also known as GPS NAVSTAR (Navigation Device with Time and Ranging). For precision purposes, a GPS receiver needs to collect data from at least 4 satellites. No information is transmitted to satellites by the GPS receiver.

In many applications, such as Smart Phones, Cabs, Fleet management etc, this GPS receiver is used. GPS receiver module gives output in standard (National Marine Electronics Association) NMEA string format. It provides output serially on Tx pin with default 9600 Baud rate. Figure 7 shows the image of GPS module.

Figure 7 Image of GPS module

5. ADVANTAGES

- This method is a system of urgent assistance.
- Monitors all risks and hazards.
- To the nearest hospitals and police stations, warning notices are sent.
- It can be included in an affordable program. The warning message about the accident is sent automatically.
- It is possible to use this scheme for a social cause.

6. APPLICATIONS

- It can be used to shield passengers in cars/motor vehicles.
- It may be used by the health department to survey the wider scale of incidents that have occurred.
- We can also use this framework in traffic estimation with some modifications.

7. CONCLUSION

This device offers the most realistic alternative to the inadequate emergency services given to victims of road accidents. With the aid of this technology, when an accident happens, prompt action can be taken by alerting the appropriate individuals by sending a message.

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