Accident Sensor with Google Map Locator

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Abstract

According to statistics"road to safety", in a highly populated country like India, the usage of vehicles are rapidly increasing and at the same time people lose their lives because of accidents and poor emergency facilities. Hence, the value of human life is ignored. These lives could have been saved if medical facilities were provided at the right time. This paper proposes a system which can be installed in any car on the road at a minimal cost, acting as a solution to the mentioned drawback. An accelerometer sensor is used to sense the vibrations and tilt generated by the vehicle when it meets with an accident. This digital output from the sensor is used by the Arduino Uno controller, which is the heart of the system, to trigger the GSM module to deliver an SMS to preprogramed numbers such as ambulance, police station, family member of the victim etc. indicating that an accident has occurred. The accident location is provided by the global positioning system (GPS), which provides the latitude and longitude of the location, and with this information a link is sent in the SMS depicting the accident spot via Google map service provider.

Keywords: Accident, Accelerometer sensor, Arduino Uno, Google map, GPS, GSM

I. INTRODUCTION

With the rapid development of society, there are some side-effects including the increasing number of car accidents. On an average one out of every three motor vehicle accidents results in some type of injury. There are many solutions proposed to avoid the problem. The dominating features of most cars seen on the roads today revolve around safety system. Safety is a top concern for automakers and will continue to be as long as cars remain on the road. Our goal for the automotive safety system is to provide a level playing field for all vehicles, regardless of age on the roads. These risks include collisions and nonresponsive drivers after accidents and lack of location information after an accident has occurred. Our Accident sensor system has two parts, first is controlling device which sends the messages and the other is mobile unit which receives the messages. The system processes, interfaces, connections, data transmission and reception of data between the controlling device and mobile unit are working successfully. The main objective of the system is to provide security for the vehicle user and also detects the accident if occurred and informs the respective authority through wireless technologies. Many lives are lost due to improper post-accident signaling and tracing out the exact location. Our project provides solution for the above stated problem which involves intimating the nearby hospitals and relatives by giving the accident location of vehicle using GSM and GPS technologies. If any accident occurs in highway or any other place, the accident information system will get activated and message will be transmitted to respective authority. In case of any accident, the tilt in the accelerometer sensor increases beyond the limit and information is sent to GSM module. The GSM can send message to respective authority along with the exact location of the accident. This exact location is determined by the GPS server by determining the latitude and longitude of the location. The location can be viewed by the emergency service personality via the Google map locator. The heart of our system is the Arduino controller, which acts as an interface between all the modules. Thus this system ensures life security.

II. METHODOLOGY

This project is an intelligent accident alert system which not only notifies accident occurrences but also provides its exact location where the accident has taken place. The system core is built around the powerful Arduino microcontroller. A 3 axis

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accelerometer connected to Arduino is used to detect the accident condition. On detection, Arduino reads the current coordinates from GPS module and sends an SMS to predefined numbers though SIM900 GSM modem. This SMS carries location information, so a quick help can be sent to save the victim. This system is not only efficient but also worthy to be implemented. To make this process all the controls are made using Arduino whereas a LCD is used to display the coordinates.

III. BLOCK DIAGRAM

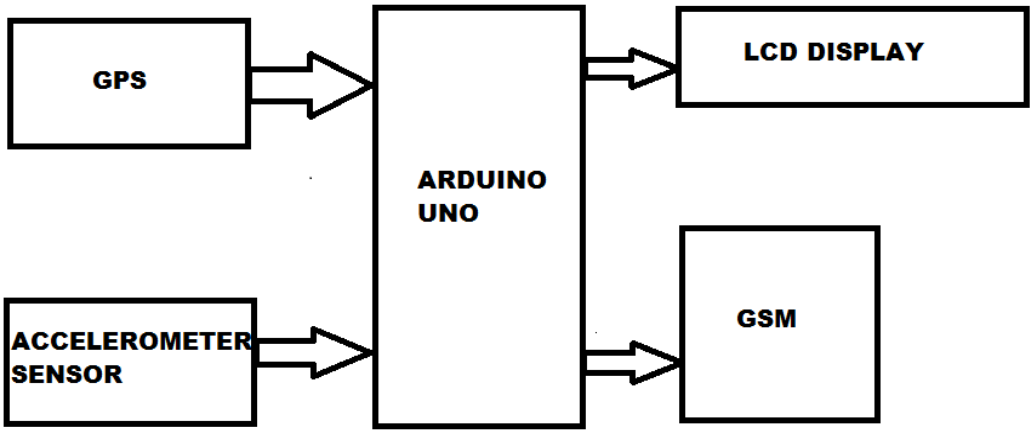

Fig. 1:

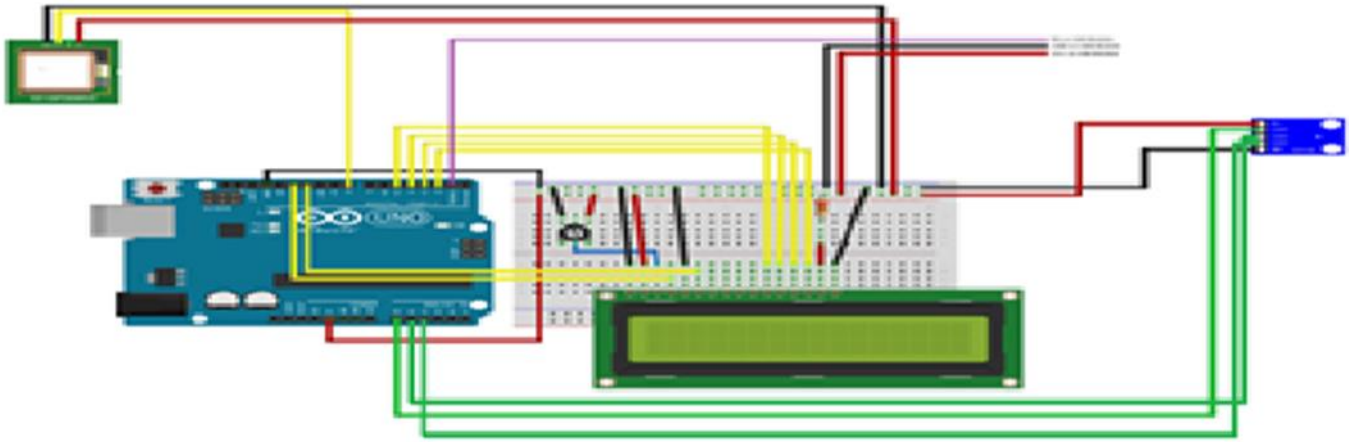

Fig. 2:

IV. HARDWARE DESIGN

A. GPS Module

The System (GPS Global Positioning) is a space age navigational system that can pinpoint your position anywhere on the globe, usually within a few yards or meters. GPS uses a constellation of 24 satellites in precise orbits approximately 12,000 miles above the earth. The satellites transmit data via high frequency radio waves back to Earth. GPS uses satellite ranging to triangulate your position. In other words, the GPS unit simply measures the travel time of the signals transmitted from the satellites, then multiplies them by the speed of light to determine exactly how far the unit is from every satellite it's sampling.

Distance= velocity (speed) x time

Then locking onto signal from minimum 3 different satellites, GPS can calculate a latitude and longitude and track movement. With four or more satellites in view, the receiver can determine the user's latitude, longitude and altitude. GPS receiver uses NMEA -0183 protocol as defined by the National Marine Electronics Association (NMEA). It gives output messages as follows. So we get 7-8 different messages.

GGA-Global positioning system fixed data. GLL- Geographic position – latitude/longitude.GGA contains message ID, UTC position, latitude, longitude, north-south, east-west. Message ID- $GPGGA that is called as protocol header. These all data retrieve into software microcontroller. Then this date (location) is send to preprogrammed number using GSM system.

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Fig. 3:

B. Arduino

The Arduino Uno is a microcontroller board base on the ATmega328. ATmega has features like speed 20MHz, power supply 1.8 - 5.5 ,operational range -40 degree celcius to 85 degree celcius , 32KB flash ,1KB EEPROM ,2KB RAM . Arduino has 14 digital input/output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16MHz crystal oscillator ,a USB connection, a power jack, an ICSP header, and a reset button.

We have used three analog pin which is taking input from the accelerometer(x-axis, y-axis and z-axis),seven digital pins out of which 6 are connected to the LCD display and one to the transmitter pin of GPS module, pin1(tx) is connected to receiver pin of GSM modem.

Fig. 4:

C. GSM module

GSM is global system for mobile communication and used to send message to pre-programmed number. The modulation technique used is GSMK. The protocol used by GSM modem for setup and control is based on the Hayes AT- Command set. AT is the abbreviation of Attention. GSM AT commands are extension commands. For example, +CMGS (Send SMS message), +CMGL (List SMS messages), and +CMGR (Read SMS messages) are extended commands. The main objective of this application is whenever accident occurs it will send message and position of vehicle which is accessed using GPS to pre-programmed number.

We have used only 2 pins of GSM module RX and GND. It is externally powered with a 12V adaptor.

GSM Air Interface specifications:

Table - 1

Parameter	Specifications
Forward Channel Frequency	935-960MHz
Reverse Channel Frequency	890-915MHz
Tx/Rx Frequency Slotting	45MHz
Tx/Rx Time Slot Spacing	3 Time slots
Frame Period	4.615ms
Users per Frame	8
Time Slot Period	576.9µs
Bit Period	3.692µs
Modulation	0.3GMSK
Modulation Data Rate	270.833333kbps
ARFCN Number	0 to 124 and 975 to 1023
ARFCN Channel Spacing	200KHz
Interleaving	40ms

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Fig. 5:

D. Accelerometer Sensor

An accelerometer is a Micro-Electro Mechanical System (MEMS) sensor which measures static (earth gravity) or dynamic acceleration in all three axes. It measures level of acceleration where it is mounted which enable us to measure acceleration/ deceleration of object like car, or tilt of a platform with respected to earth axis, or vibration produced by machines. Accelerometers measure in terms of 'g' ('g' is acceleration measurement for gravity which is equal to 9.81m/s²). Acceleratometer converts mechanical motion into electrical output. Schematic of Acceleratometer is shown in figure below.

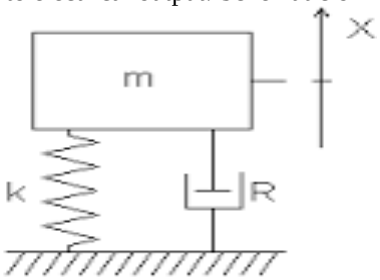

Fig. 6: Schematic of Accelerometer

Mass is a sensing element which is connected to system through spring K and damper R. when system is subjected to acceleration, Mass deflects. This deflection of mass is converted to electrical signal. Summation of all the forces on mass is 0.

$$ma + R(dx/dt) + Kx = 0$$

$$ma = -R(dx/dt) - Kx$$

$$a = -(R/m)(dx/dt) - (K/m)x$$

where m= mass of the body, x=relative movement of mass with respect to the frame, R= damping coefficient, K= spring coefficientThus by knowing x, R, K for a specific sensor, acceleration can be determined.

Fig. 7:

E. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 charactersper line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two

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registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

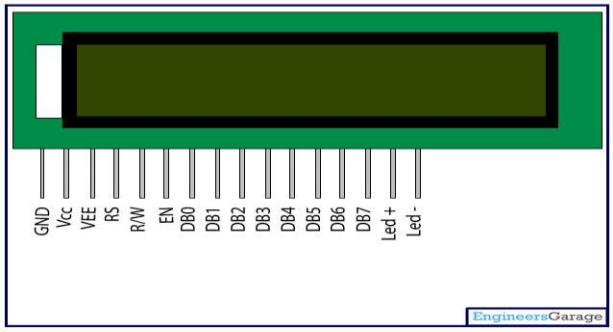

Fig. 8:

V. FLOW CHART

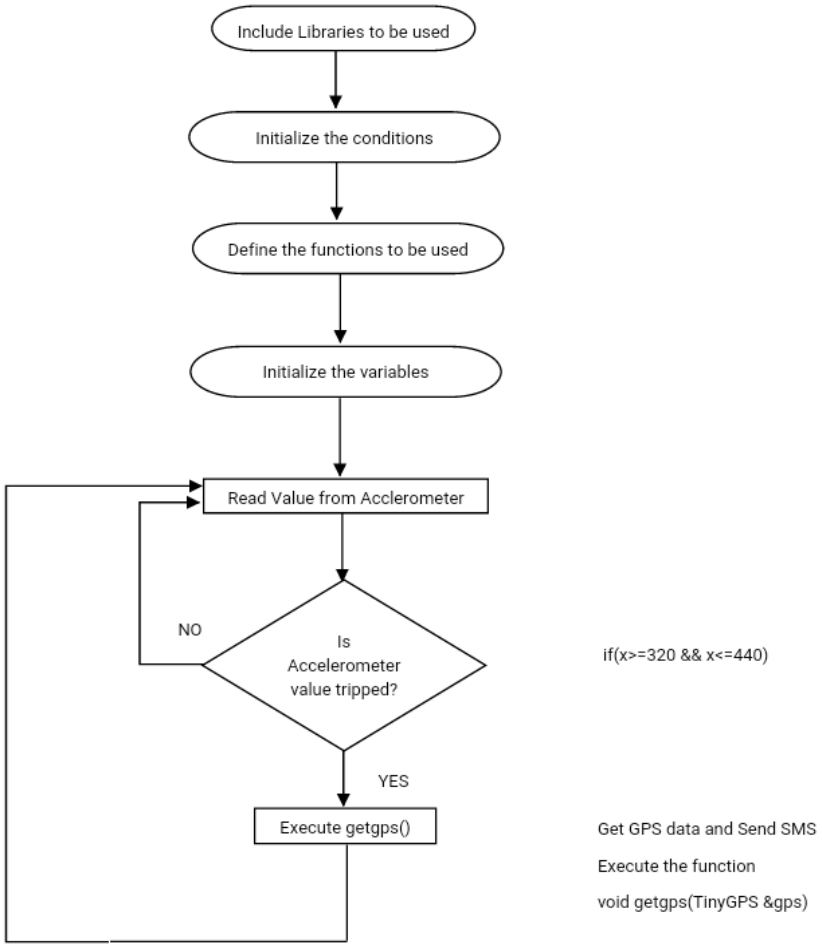

Fig. 9:

VI. CONCLUSION

This paper provides the design which has the advantages of low cost, portability, small size and easy expansibility. The platform of the system is Arduino Uno along with accelerometer sensor, GPS and GSM, interfacing which shortens the alarm time to a large extent and locates the site of accident accurately via Google map service provider. This system can overcome the problems of lack of automated system for accident location detection. Consequently, the time for searching the location is reduced and the person can be treated as soon as possible which will save many lives.

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This system has multiple application like it can be used for physically disabled person to send his current location incase he is in trouble and needs help by simply replacing accelerometer sensor with a switch

REFERENCES

[1] sites.ndtv.com
[2] www.engineersgarage.com
[3] www.atmel.com
[4] www.propox.com/gsm/sim900
[5] www.sparkfun.com/datasheets/GPS/Modules
[6] www.sparkfun.com/datasheets/Components/SMD/adxl335
[7] https://www.arduino.cc/

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