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Study on Vehicle Accident Detection and Messaging System Using GPS and GSM

Priyanka A. Pande[1], Shreya S. Verma[2], Palash Nimbalwar[3], Purushottam Wankhede[4]

Department of Electronics and Communication Engineering

RCOEM, Nagpur

Corresponding Authors: *priyankaap080@gmail.com[1]*

Abstract

In the present scenario, the rapid growth of technology has not only made our lives easier but the enormous growth of technology has also resulted in various traffic hazards and road accidents which has lead to a huge loss of life and property due to the various poor emergency facilities. India is one of the most accident-prone countries in the world with a record rate of more than 3 lakhs of road crashes every year. In such highly populated countries like India , everyday people lose their lives because of accidents and poor emergency facilities. These lives could be saved if medical facilities are provided at the right time. According to the literature survey we have found that there has been an increase of 4% in the total number of death rates caused by the road accidents during the period 2011-2014. As per the national crime records bureay (NCRB) in the year 2011 there were 440,123 road accidents resulting in the death of 136,834 people.

This paper proposes a new dimension in order to allow early response and rescue of accident victims thereby saving the lives and properties. This system uses the capability of GPS and GSM along with the android phone for providing a solution which can be used to precisely detect the accident spot and to send the emergency notification to the nearby hospital's ICU and to the victim's relatives. This system can easily be fitted in the vehicle , its basic operation includes the vibration sensor which detects the accident and in turn sends the signal to arduino. The arduino then takes control and starts collecting the coordinates from GPS which are the sent to the emergency system by using the GSM module.

Keywords: *GPS (global positioning system),GSM (global system for mobile application),Vibration sensor, SMS(short message service),Android phone, SMS notification to hospital*

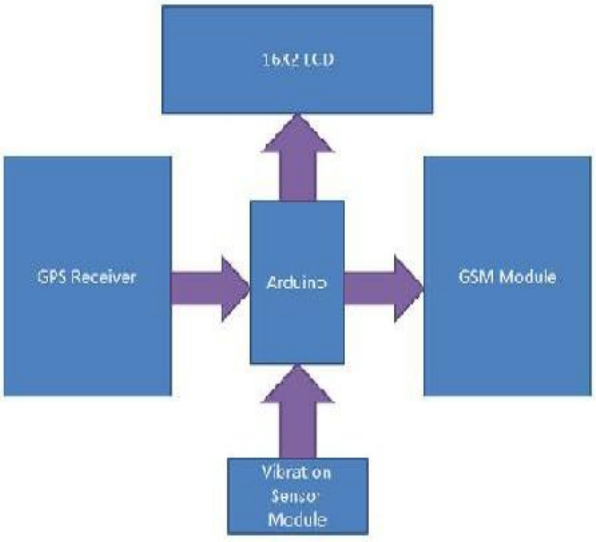
1. INTRODUCTION

Transportation has great importance in our daily life and its development has made many of our chores much easy. But it can cause disaster to us and even can kill us through accidents. Road accidents constitute the major part of the accident deaths all over the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non fatal injuries. Road traffic injuries are the leading cause of death among people aged among young people aged 15-29 years. According to the insurance institute for highway safety (iihs), new cars and its high tech safety features has helped to lessen auto related deaths over the last 12 years. Though its credits technology for lessening auto accidents, yet the iihs cannot help accusing bad driving behaviours.

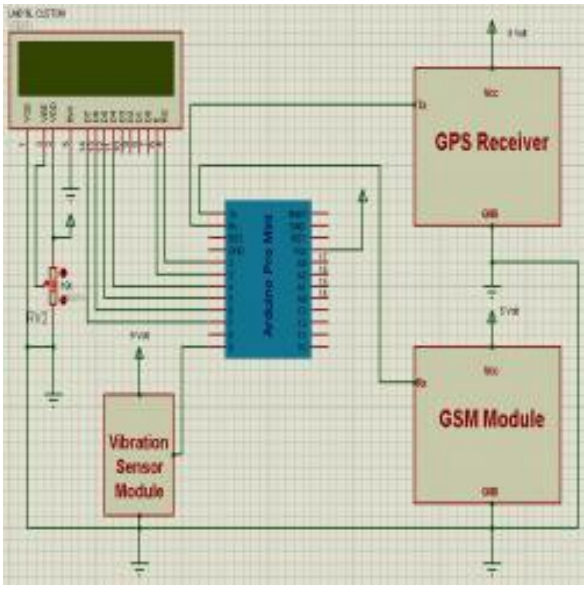
Automatic vehicle accident detection and messaging system is an embedded intelligence implanted in the automobile. The purpose of the project is to find the vehicle where it is and to locate the vehicle by means of sending a message using a system which is fixed into the vehicle system. In order to provide emergency treatment to the injured people, at first we need to know the accident spot by tracking the location and sending a message to the relative ones and the nearby emergency services. So in this work we are basically using the arduino board for cost effective and also for the easy understanding .here we have used the assembly language programming in order to get a better accuracy, also the GPS and the GSM modules help in tracking the vehicle. The exact location of the vehicle is sent to our mobile phones using the GSM modem. Apart from these purposes the system can be used for tracking of stolen vehicles and travelling luggage, fleet management and vehicle sales etc.. the system consists of a single board embedded system that contains GPS and GSM modems connected with the arduino board. The entire system is quite easy to be installed in any vehicle. Here a vibration sensor is used which measures the vibrations at the location it is placed. The signal is then compared with the standard values which further checks the accident of the car ,vibrations produced by the machines. Global positioning system

(GPS) is used to identify the location of the vehicle . GSM is used to inform the exact vehicle location to the precoded mobile numbers .message will give longitude and latitude values. From these values location of accident can be determined. The project focuses at intelligent security system providing situational awareness and the proper safety.

2. BLOCK DIAGRAM:



3. CIRCUIT DIAGRAM:



4. WORKING:

Accident detection and messaging system is quite easy and the primary component which is used is vibration sensor , which detects the accident and in turn sends the signal to arduino. At this point the control is transferred to arduino which then starts collecting the coordinates of the accident spot , received from the GPS which are later sent to the nearby trauma emergency monitoring services by using the GSM module.

In this project we are using a vibration sensor having a fixed range of detection that operates at a particular frequency . When the vehicle is hitted or dashed with any other object or vehicle , the vibration sensor detects whether the vibration is in the range or not. If the range of detection is more it reports as accident and activate GPS module which will start collecting the coordinates of that particular location .it comprises of a keypad which is kept at convenient place controlled by the person .

The vibration sensor then waits for a certain duration that is for one minute to confirm the accident. If the person inside the car is not met with the accident then he is able to press the keypad and stop the gsm from sending the location which was earlier tracked by gps and avoid calling the ambulance,police station and family members. If the range is greater than the threshold then the person who has met with accident Will not be able to press the keypad. This further confirms that a major accident has occurred. This will activate gps to collect the coordinates of that particular accident spot and gsm will then send the latitude and longitude to the respective family members and the nearby police station followed by the ambulance

5. GLOBAL POSITIONING SYSTEM:

The Global Positioning System (GPS) is a navigation system based on satellite which consists of 24 satellites fitted into orbit by the United States Department of Defense (USSD). GPS was mainly intended for military applications, but in the 1980s, the government made its use for the civilian purpose. GPS works in each and every weather and any season, each and every corner in the world, 24X7 hours a day. There are no subscription fees to use Global positioning system.

Velocity or speed is defined as distance / time ,where Velocity of the GPS signal represents the speed of light, approximately 300,000 Km/s. GPS

transmissions occur on a frequency of 157.542 and 122.760 GHz.

OPERATIONS OF GPS:

The Global Positioning System sends its signals to objects on the ground. GPS receivers then actively receive satellite signals; GPS receivers need an clear view of the sky ,because they are used only outdoors and they often do not perform well within forests and in nearby localities.

GPS operations depend work on high accuracy phenomenon, provided by atomic clocks on board. GPS satellite sends data that describes its location and the current time. GPS satellites synchronize their operations so that all recursive signals are transmitted at same instant. The signals, moving at the speed of light, arrive at a GPS receiver at slightly different times because some satellites are located away at a distance from each other. The distance to the GPS satellites is calculated by estimating the quantity of time it takes for their signals to reach upto receiver. When the receiver estimates the distance for at least four Global Positiong System satellites, it calculates its position in three dimensions. There are a minimum of 24 operational GPS satellites at all time. The satellites, operated by the U.S. Department of Defence, revolve around the orbit with a period of 12 hours at an altitude of about 11,500 miles travelling at near 2,000mph. Ground stations are used to precisely locate and keep an eye on each satellite's orbit.

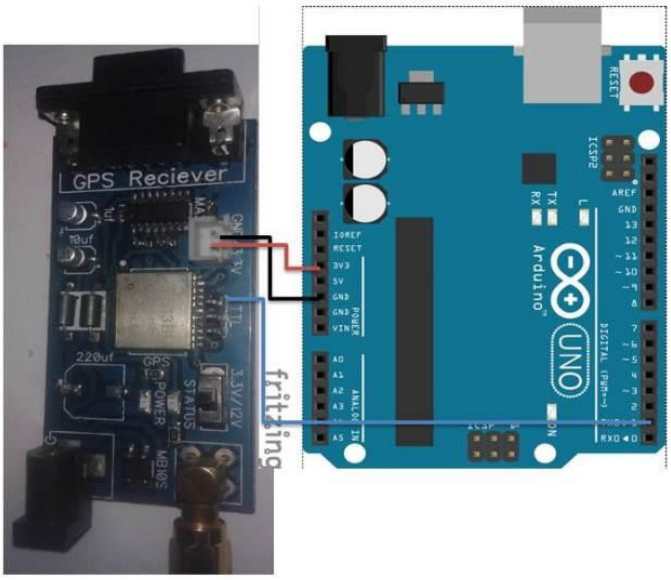


Fig. 1.

6. MICROCONTROLLER ATMEGA328P:

Here Atmega328p microcontroller is the heart which is used to control the accident detection and reporting system. It's an 8-Bit microcontroller. One program is written in the C language to control, it is then compiled and then after that it is saved in the microcontroller's flash memory. It has features like:

1) Low power consumption
2) Two 8-bit Timer, one 16 bit timer
3) 6 PWM Channels
4) 32KB programmable flash memory,
5) 8-channel 10-bit ADC package
6) Two Master/Slave SPI Serial Interface
7) High performance
8) Power-on Reset
9) 23 Programmable I/O
10) Power Consumption at 1MHz, 1.8V, 25°C
11) Operating Voltage:1.8 - 5.5V
12) Temperature Range: -40°C to 105°C

FORCE SENSOR (FSR 408):

It is a single zone force sensing resistor optimized for the use in human touch control of electronic devices such as automotive electronics, medical system and in industrial and robotics applications It is a sensor that detect physical pressure, squeezing and weight which are simple to use and has low cost with sensing region of 0.25"*24".we are allowed to press anywhere along the strip and pressure can be recognized easily.

It is two wire device with sensing area of round diameter ,0.5" .The resistance of FSR varies depending upon how much pressure or force is being applied to its force sensing area. When the applied force is maximum or more, at that time the resistance of FSR reduces or is lower. When no pressure is being applied on force sensing area of FSR, then the resistance will be maximum i.e more than 1 M.

Hence FSR can sense the applied force in the range of 100g to 10kg.

The response of FSR is sensitive to the distribution of force being applied on it.

CONSTRUCTION:

It is made of plastic and connection tab compressed on delicate material .The way of connecting is to simply plug them into a breadboard or we can use a clamp –style connector like female header. It is also possible to solder it on to the tabs but for this we have to be very fast because if we

are using bad quality iron or delay by few seconds, it will melt the plastic and ruin the FSR.

Features:

1) It is available in any active length up to a 609.6mm X 10.2mm width active area and is available in 4 connection options.

2) Range of size: MAX=20"*24 and MIN=0.2"*0.2Thickness of device:0.008" to 0.5"

3) Force sensitivity range <100g to >10kg

4) Temperature Range:-30C to 70C

5) Force accuracy range=Plus minus 5% to Plus minus 25%

6) Low cost

7) Easy to use

APPLICATION:

1) Automotive industry
2) Pharmaceutical industry
3) Medical system
4) Industrial and robotics application

7. GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION):

In our project, we are using GSM for sending the coordinates of accident occurred location which were taken by GPS to pre-programmed number(Police, Ambulance and the emergency services)via message .

The modulation technique used in GSM is GMSK. The protocols used by GSM for setup and control is based on AT(Attention)-commands. So the main aim of using GSM is whenever any accident has taken place, it will instantly send message to pre-programmed number and also the position of vehicle is also sent. GSM is widely used mobile communication system in the world. It is openly available and digital cellular technology used for transmitting mobile voice as well as data services that operates at 850 MHZ, 900MHZ, 1800MHZ and 1900MHZ.

It digitizes and reduces the data, then sends it 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. The five distinct cell sizes in a GSM network are macro, micro, pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

WORKING:

The GSM modem which has a mounted simcard receives the digit command by SMS from any cell phone and sends that data to the MC through serial communication. During the execution of the program , a 'STOP' command is received by the GSM modem to develop an output at the MC and its contact points are used to disable the ignition switch.

The command is then sent by the user and is based on an intimation received by the user through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over Mobile.

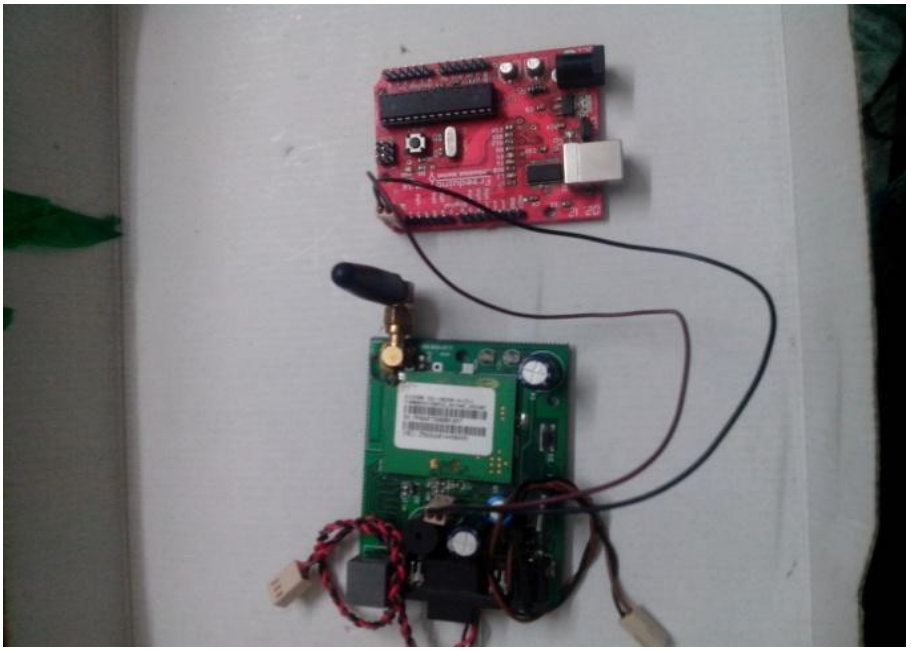


Fig 2

GSM ARCHITECTURE:

GSM network components are given as:

- ***A Mobile Station:*** It is basically a cell phone consisting of a transceiver, a display unit and a processor and is SIM card operating over a particular network.

- ***Base Station Subsystem:*** It acts as an interface between the mobile station and the network subsystem. The Base Transceiver Station consists of radio transceivers which handles the protocols for communication with mobile phones. It also consists of a Base Station Controller unit which controls the Base Transceiver station which acts as an interface between the mobile station and mobile switching centre.

- ***Network Subsystem:*** It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to various networks like ISDN and PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the routing of call and roaming capabilities of GSM. It also consists of the Equipment Identity Register which operates an account of all the mobile equipments wherein each mobile is identified by its individual and a secured IMEI number. IMEI stands for International Mobile Equipment Identity.

Features of GSM Module:

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

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APPLICATIONS:

1) Used in automotives and transport vehicles from lighter vehicles like cars , to heavier auotomotives like ships and aeroplanes

2) Remote Monitoring and providing security services to military vehicles.

3) This system is also can be interfaced with vehicle airbag system such that when the sensors detect the accident, the air bags get opened.

4) 4.School transport Tracking: “Vehicle tracking system”can be used in the school bus for tracking.

5) 5.This project can be used for detection of cab or car of companies.

6) 6.Theft Protection: This Project can be used to recover vehicles from vehicle theft.

RESULTS AND CONCLUSION:

With the system, it becomes convenient for the family members of users to detect the location of accident of their vehicles.Also, the system would detect people who are too drunk with alcohol and stop them from driving the vehicle. We firmly believe that the deaths can be prevented by quick response with the help of this system. Hence this accident detection and reporting system which is not only effective but also very affordable would surely help a lot to prevent loss of life.

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