Automatic Vehicle Accident Detection and Alarm System

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Abstract— The Rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. In this project, an Arduino based vehicle accident detection and rescue information system is developed in order to detect vehicle accident and send the location information of the accident place to emergency authorities, nearest hospital and police station through message service. The accident is detected through vibration and accelerometer sensors.

Keywords: Arduino, vibration sensor, Accelerometer sensor, GPS module, GSM modem

I. INTRODUCTION

The development in the field of automobiles is highly increasing and which leads to the accidents and so many hazards due to traffic. People's life are under high risk. This situation prevails, just because there is a lack of emergency facilities in our country. In our country, many people lose their life because of accidents. Because of causalities or improper communication to rescue team. We are in the process of solving this issue by proposing an efficient solution and to reduce the loss of lives as much as possible. In our theory, the design of the system help us to detect accidents in significantly minimum time and transfer the fundamental information to the first aid centre within a few seconds covering the geographical coordinates, the time and the angle where the vehicle had met with an accident. This alert message is sent to the rescue team (ambulance) and the registered mobile number within short period. This real time application saves many valuable lives .The message is sent through the GSM module and the location of the incident. The basic idea is to localize the vehicle system by receiving the real time position of the vehicle through GPS and send the information through GSM module through SMS service.

II. LITERATURE SURVEY

At present criteria, we cannot detect where the accident has occurred and hence no information related to it, leading to the death of an individual. The research work is going on for tracking of the vehicle even in dark clumsy areas where there is no network for receiving the signals.

To protect the vehicle and tracking so many advanced technologies are available in now a days. In olden days the information of accident can be transferred, but the place of accident spot cannot be identified. In many vehicle airbags are designed, air bags are used for security and safety travels. The air bag system was introduced in the year of 1968. TPMS is system designed to control the pressure inside the pneumatic tires on vehicles that provides different operating conditions such as a lower tire pressure is desired in order to maximize traction, maneuvering through challenging terrain, pulling a heavy load out of an incline at slow speeds, crawling out of soft dirt. The pressure ranges from 15 to 45 PSI. Many other systems have been proposed to deduce the accident. The existing system deals with two sensors where accelerometer sensor is used to detect the angle and vibration sensor is used for detection the change in the vehicle. The main aim of this Existing system is to provides the location of the accident using Atmega 328 Microcontroller. The information is send to the saved mobile numbers. This idea of automatic ambulance rescue system (AARS) is all about procuring the life of mishap individual. In this proposed system if a vehicle has met with an accident, vibration sensor or fire sensor gives the electric signal to the microcontroller. The location coordinates are identified using GPS and sent to the control centre using GSM modem. In control section, the GSM modem receives a message about the accident and sends it the emergency authorities. In this system, communication gets delayed due to the usage of GSM modem which is a slow process of transfer of a message and communication using GSM modem causes interference.

III. METHODOLOGY

To overcome the existing problem we will implement a new system in which there is automatic detection of the accident. A vibration sensor is fitted in every vehicle and when an accident occurs, signals from the vibration sensor are sent to the microcontroller. The signal is transferred from microcontroller to the central unit using arduino platform. The GPS module provides the latitude and longitude coordinates of victim vehicle which are sent to the control using arduino platform. The central unit sends the location coordinates to the emergency services. The central unit will be placed in a police station or a hospital that receives the signals from vehicle unit. It sends an alert message to the ambulance that is nearer to the location of the accident. The ambulance is also equipped with a GPS receiver for tracking of the accident location. This helps ambulance to reach the location in time and save the victim.

IV. BLOCK DIAGRAM
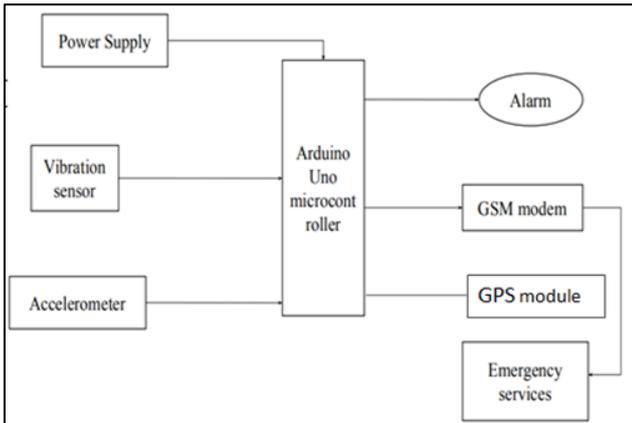
The following hardware components are used in this system

A. Arduino Uno:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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.

B. GPS Module:

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three dimensional location (latitude, longitude, and altitude) plus the time.
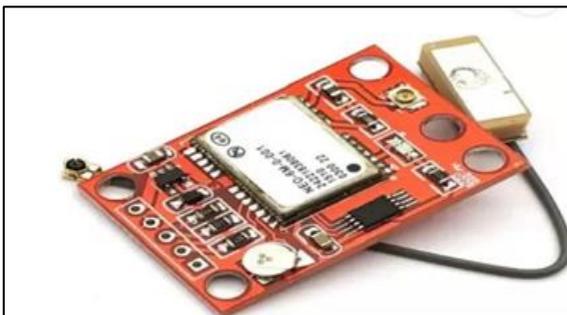
C. GSM Module:

Here a GSM mobile hand set is used. GSM networks are originally from the most popular standard for mobile phones in the world, GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system. This has also meant that data communication was easy to build into the system. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity.

### D. Shock Sensor/ Vibration Sensor:

Our sensor has four pins, which are:
– First one is Vcc so apply +5v here.
– Second pin is GND.
– Third pin is out, it. the output pin indicates whether there vibration or not.
– Fourth pin is used as variable factor

With the help of a simple ceramic piezo-electric detector it is possible to assemble an Impact sensor unit, which can be used to detect impact and vibration on the vehicle.

The sensor supplies a voltage proportional to the acceleration of the impact or vibration, for example 40mv/g i.e. Output is near 2v for 60g impact.

E. Operation:

The smart Vibration sensor used in our project exploits the piezoelectric property of the piezo electric crystals. Our smart vibration Sensors detect accident occurrence and send a signal to the connected microcontroller. Vibration sensor is a device which is used to sense the collision or impact. Vibration sensor converts the mechanical energy generated due to collision into electrical impulse When the produced electrical impulse exceeds the set threshold, the microcontroller 18 activated and the concerned program starts to execute When a collision occurs, the magnet starts moving due to spring action which generates a small EMF. If this signal is greater than the threshold signal the signal is passed on to other connected devices, else it is ignored. The sensitivity of the vibration sensor can be changed using variable resistor.
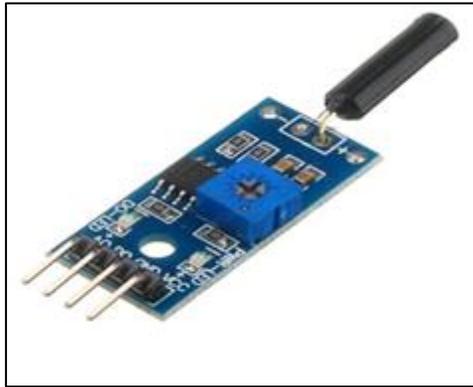
F. Limiting Switch:

A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection It is used as a power reset button in our project.

G. Accelerometer Sensor:

The basic underlying working principle of an accelerometer is such as a dumped mass on a spring. When acceleration is experienced by this device, the mass gets displaced till the spring can easily move the mass, with the same rate equal to the acceleration it sensed. Then this displacement value is used to measure the give the acceleration. Accelerometers are available as digital devices and analog devices. Accelerometers are designed using different methods. Piezoelectric, piezo resistive and capacitive components are generally used to convert the mechanical motion caused in accelerometer into an electrical signal.

Piezoelectric accelerometers are made up of single crystals. These use the piezoelectric effect to measure the acceleration. When applied to stress, these crystals generate a voltage which is interpreted to determine the velocity and orientation.

V. CONCLUSION

The proposed system deals with the accident alerting and detection. Arduino atmega 328 microcontroller is the heart of the system which helps in transferring the message to different devices in the system. Impact sensor will be activated when the accident occurs and the information is transferred to the registered number through GSM module. Using GPS the location can be sent through tracking system to cover the geographical coordinates over the area. The accident can be detected by an impact sensor which is used as major module in the system.

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