ARDUINO BASED VEHICLE ACCIDENT DETECTION SYSTEM

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ABSTRACT: Vehicle accidents are one of the most leading causes of death. Road accident is the most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that we don't learn from our mistakes on the road. Most of the road users are quite well aware of the general rules and safety measures while using the roads, but it is only the laxity on the part of road users, which causes accidents and crashes. The main cause of accidents and crashes are due to human errors. We are elaborating some of the common behaviors of humans, which results in accidents.
1.Over Speeding
2.Drunken Driving
3.Distractions to Driver
4.Red Light Jumping
5.Avoiding Safety Gears like Seat belts and Helmets
6.Non-adherence to lane driving and overtaking in a wrong manner
To save people life's from a road accident, we are going to build an Arduino based vehicle accident alert system using GPS, GSM, and accelerometer. The accelerometer detects the sudden change in the axes of the vehicle and the GSM module sends the alert message on your Mobile Phone with the location of the accident. The location of the accident is sent in the form of the Google Map link, derived from the latitude and longitude from the GPS module. The Message also contains the speed of a vehicle in knots.
Keywords: Vehicle accident, Accelerometer, Arduino, GSM, GPS.

I. INTRODUCTION

Whenever a road accident happens, the people nearby have to manually call the ambulance which causes a waste of time. Hence there is a delay for emergency services to arrive at the location of the accident. In order to fix this problem, we are going to build a system that will provide the emergency facilities for the victims in the shortest time possible. It incorporates an embedded system that contains GPS and GSM modules connected with an Arduino UNO. The entire set-up is installed at the front end of the vehicle. Global Positioning System (GPS) is used to identify the location of the vehicle. GSM is used to inform the exact vehicular location in the form of the longitude and latitude coordinates to the precoded numbers using an SMS. GSM module provides a two-way communication by using a SIM card. Such a module works in the same manner as a regular phone. This application provides the optimum solution to poor emergency facilities provided for road accidents in the most feasible way.
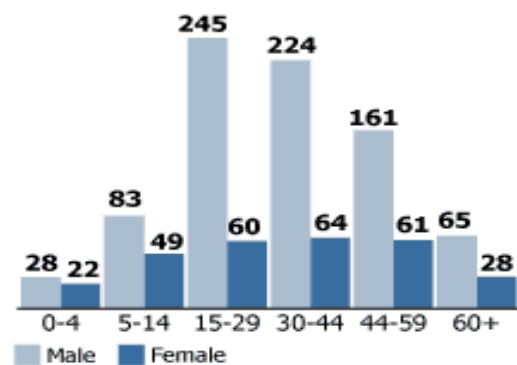

Figure 1: Road Traffic Deaths Worldwide by Sex and Age Group, 2002
Source: WHO Global Burden of Disease Project, Version 1 (2002).

II. METHODOLOGY

Accident detection and the messaging system can be fitted in a vehicle (Ambulance & Police) and they are informed about any such incident at the go. Accident detection and messaging system is simple as the system makes use of GSM & GPS technologies. GPS is used for taking the coordinate of the site of the accident while GSM is used for sending the message to the phone. To make this process all the control is made using Arduino whereas LCD is used to display the accident.

III. BLOCK DIAGRAM OF THE SYSTEM

IV. HARDWARE COMPONENTS REQUIRED

A. Arduino UNO
It is the heart of our system. The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. [The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board features 14 Digital pins and 6 Analog pins. It is programmable with the ArduinoIDE(Integrated Development

Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

B. GSM Module (SIM900A)
The SIM900 is a complete Quad-band GSM/GPRS Module which can be embedded easily used by the customer or hobbyist. SIM900 GSM Module provides an industry-standard interface. SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. It is easily available in the market.
 SIM900 designed by using single-chip processor integrating AMR926EJ-S core
 Quad-band GSM/GPRS module in small size.
 GPRS Enabled

C. GPS Module (SIM28ML)
Global Position System(GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the earth where there is an unobstructed line of sight to four or more GPs satellite. The system provides critical capabilities to military, civil, commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

D. ACCELEROMETER
An accelerometer sensor is used to check whether an automobile meets with an accident with or not. As the automobile is inclined with the road with 0 or 180 degrees. As the inclined angle changes the probability of accident increases and accelerometer sends information to the Arduino UNO ATmege328p microcontroller.

E. 16x2 LCD
16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in the 5x7 pixel matrix. This LCD has two registers, namely, command and data. The command register stores the command instruction 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.

F. Power Supply
A power supply is an electronic device that supplies electrical energy to an electrical load. Here Arduino UNO, sensor, GPS, GSMoperates with DC 12V supply

V. WORKING OF SYSTEM
Arduino is used for controlling whole the process with a GPS Receiver and GSM module. GPS Receiver is used for detecting coordinates of the vehicle, the GSM module is used for sending the alert SMS with the coordinates and the link to Google Map. Accelerometer namely ADXL335 is used for detecting accident or sudden change in any axis. And an optional 16x2 LCD is also used for displaying status

messages or coordinates. We have used GPS Module SIM28ML and GSM Module SIM900A.

Now whenever there is an accident, the car gets tilt and accelerometer changes his axis values. These values are read by Arduino and checks if any change occurs in any axis. If any change occurs, then Arduino reads coordinates by extracting $GPGGA String from GPS module data (GPS working explained above) and sendSMS to the predefined number to the police or ambulance or family member with the location coordinates of accident place. The message also contains a Google Map link to the accident location, so that location can be easilytracked. When we receive the message then we only need to click the link and we will redirect to the Google map and then we can see the exact location of the vehicle. The speed of Vehicle, in knots (1.852 KPH), is also sent in the SMS and displayed on the LCD panel.

VI. FUTURE SCOPE
In the future, we can interface with different sensors such as alcohol detector, drowsiness detector, heart rate detector, etc. In terms of this, we can really prevent an accident and save lives. This can also be developed by interconnecting to a controller module that takes the photographs of the accident spot that makes the tracking easier.

VII. CONCLUSION
The proposed system is developed to provide information about the accident occurs and the location of the accident. It helps to easily provide assistance and help to the victim of the accident. This system uses a GPS module to locate the vehicle. GSM is used to provide information of an accident. The results of the proposed systems are satisfactory.

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