Wireless System for Vehicle Accident Detection and Reporting Using GPS

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Abstract – In highly populated countries every day people loss their lives because of accident and poor emergency facilities. This lives could have been save if medical facilities are provided at right time. This paper implies a system which is a solution of this drawback when a vehicle meets an accident immediately a accelerometer sensor will detect the signal and send it to the Arduino Microcontroller. Microcontroller will send an alert message through the GSM modem including the location to the police station, Emergency Medical Services (EMS) and family member. So the police or EMS immediately Trace the location through the GPS modem after receiving information. To avoid accident due to drowsiness- in case of drowsiness of driver and an alcohol is detected in case of high intake of alcohol by user are used, then vehicle would not start after there. The proposed system have been practically designed by the use of hardware components and the results are satisfied with expectation.

Index Terms – Accident detection, wireless system, Accelerometer sensor, AVR controller, GPS device, GSM modem.

I. Introduction.

With the growing population the use of vehicle has become superfluous and this has lead to increases the rod accident which cases huge loss of life because of poor emergency facilities. The proposed of paper is find the vehicle where it is locate the vehicle system. Transmit the location of the accident to the police station, Emergency Medical Services (EMS) and family member. So will get the exact location by the geographical coordinates transmitted via message with the help of map. The main object of the paper is to minimizing the delay of ambulance to save the injured. Hence with this system implementation we can detect the position of vehicle where the accident has occurred so that we can provide the first aid as early as possible. In this system accelerometer detect the sudden change in the axis of vehicle and GSM module send the alert message on your mobile phone which would be entered in database with the location of the accident. Location of accident is sends in the form of Google map link, derived from the latitude and longitude from GPS modem.

To avoid drink and drive this system has the alcohol sensor to detect it and to avoid the accident due to drowsiness. Motor stop automatically whe alcohol is detected though alcohol sensor and which is display on LCD. The whole system is based on AVR controller. This controller is used to co-ordinates all the activities in the system.

II. System overview.

The present criteria, we cannot detect where the accident has occurred and hence no information related to it, leading to death of an individual. The research work is going on for tracking the position of the vehicle. In most of the casus an accident occurred due to drunken driver.
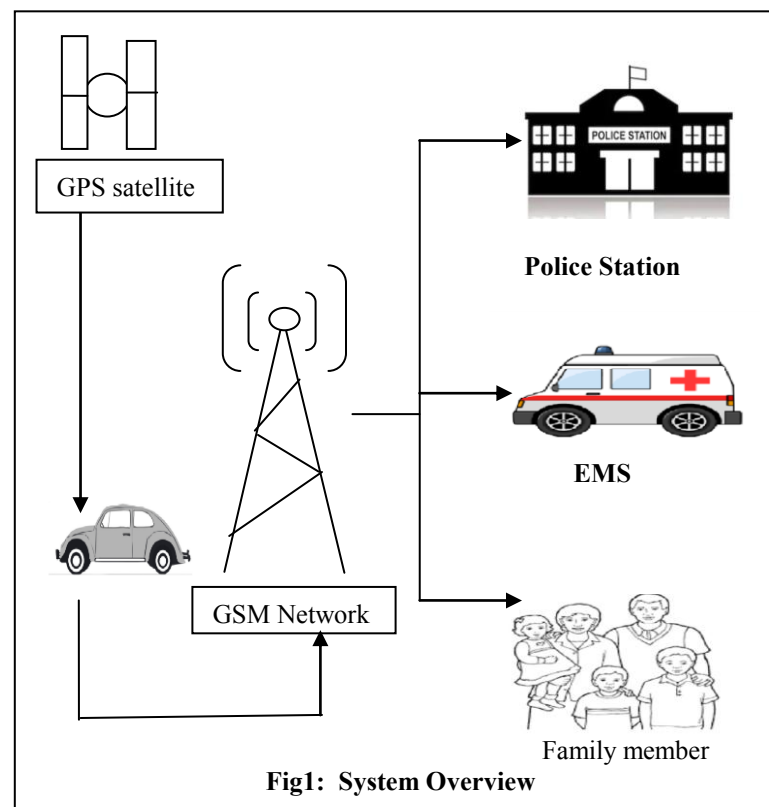

Fig1: System Overview

The system consists of AVR controller unit, Accelerometer (MPU9250) sensor, GPS device, GSM module, Alcohol (MQ3) sensor. An accelerometer is the main sensor used to detect the accident. In this system GPS is used for

tracking the position of the vehicle, GSM is used for sending alert message. To make this process all the control is made using Arduino (ATmega328) whereas LCD is used to display the accident information and also display the alcohol intensity. If rate of vibration exceeds the threshold value it well automatically sends the message to police station, EMS as well as relative of victim.

III. Hardware design.

Hardware framework for accident detection and reporting is shown in fig2. Hardware consists of AVR controller, Accelerometer, GSM model, GPS device, LCD display, and Alcohol sensor.
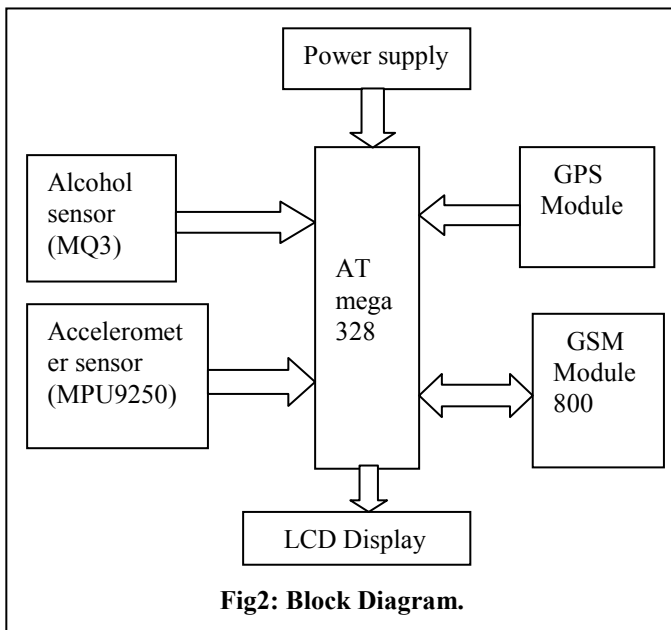
Fig2: Block Diagram.

3.1 AVR controller (ATMEGA328):

Here in the system block diagram shown in fig.2, ATmega328 is used as main micro-controller, this system is made for accident alert, the whole system is to be implemented in the vehicle itself. So when the accident happens, the accelerometer sense the vibration and also check the X-Y-Z axis of vehicle and send it to micro-controller. The GPS data like longitude and latitude can also be taken into the controller by using USART protocol.

The Atmel AVR core combines a rich instruction set with 32 general purpose working register all the 32 register are directly connected to ALU (Arithmetic and Logical Unit) allowing two dependent register to accessed in a single instruction executed in one clock cycle

The ATmega328 provide following features: 32Kbytes of in system programmable flash with Read-While-Write

capabilities, 1Kbytes EEPROM, 2Kbytes SPAM, 23 general purpose I/O lines, 32 general purpose register, Real Time Counter (RTC), 3 flexible timer/counter with compare mode and PWM, one serial programmable USARTs, 6 channel 10 bit ADC.

3.2 Accelerometer (MPU9250):

An Accelerometer is electromechanical device that measure acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic caused by moving or vibrating the accelerometer. Accelerometers are sensor or transducer that generally measure acceleration forces applied to body by being mounted directly on to surface of accelerated body. MPU9250 is a multi-chip module (MCM) consisting of two dies integrated into a single QFM package. One die houses the 3-axis gyroscope and 3-axis accelerometer.

Digital output triple axis accelerometer with programmable full-scale range of +-2g, +-4g, +-8g, +-16g and integrated bit ADCs. Accelerometer operating current is 450uA.Sleep mode current = 8uA.

The triple axis MEMS gyroscope in the MPU9250 includes a wide range of features- Digital output X-, Y-, and Z- axis angular rate sensor with user programmable full-scale range of +-250, +-500, +-1000, and integrated 16-bit ADCs. Gyroscope operating current=3.2mA. Sleep mode current=8uA.

3.3 GSM modem:

GSM is global system for mobile communication and used to send message to pre-programmed number. For communication purpose most of the modern cellular networks use the GSM technology. The modem works at 850-1900MHz. It also supports extended set of AT command which helps in editing SMS message.

SIM Com SIM900A GSM module is actual SIM900 GSM module which is manufactured by SIM Com. Designed for global market, SIM900 is a quad-band GSM /GPRS engine that works on frequencies GSM 850MHZ, EGSN 900MHZ, DCS 1800MHZ and PCS1900MHZ. SIM900 features GPRS multi slot class 10/class 8 and supports the GPRS coding schemes CS-1, CS-2,CS-3 and CS-4. With tiny configuration of 24mm x 24mm x 3mm, SIM900 can meet almost all the space requirements in the users applications, such as a M2M, smart phone, PDA and other mobile devices.

3.4 GPS device:

The Global Positioning System (GPS) is a space based global navigation satellite system (GNSS) that provides reliable location and time formation in all weather and times anywhere on or near the earth where there is an unobstructed

line of sight to four or more GPS satellite. The GPS satellite acts as a reference point from which receiver on the ground detects their position.GPS is a navigational system to find out exact location of vehicle on a earth. It uses a network of 24-34 satellites. From the earth surface the satellites are located in orbits at an altitude of 12000miles. Satellites send microwave signal to make the GPS receiver denotes the distance using velocity and time.

3.5 Alcohol sensor

Alcohol sensor is used to detect the alcohol amount present inside the vehicle. If it founds the alcohol content, then motor will be turn off. It is used to avoid the drunk and drive situation. This is very helpful in this system to take precaution to avoid road accident.

Alcohol sensor typically used as a part of the breathalyzer or breath tester for the detection of ethanol in the human breath. MQ-3 gas sensor has high sensitivity to alcohol and has good resistance to disturb of gasoline, smoke and vapor. Sensitive material of MQ-3 is SnO2, which with lower conductivity in clean air mainly used for vehicle alcohol detector.
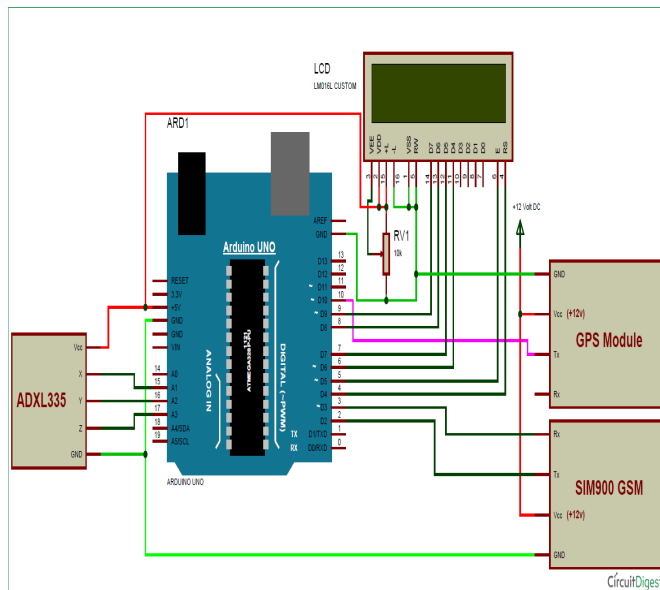

Fig3: Circuit Diagram.

IV. Methodology.

The system design for accident detection and reporting is based on ATmega328 and GPS. When vehicle meets the accident at that time accident will be detected by the accelerometer. According to this system when vehicle meets

with an accident, MPU9250 acceleration sensor will detect the signal and send it to ATmega328 controller. Immediately microcontroller send the signal to GPS module to collect current position co-ordinates values will contain longitude (N or S), latitude (E or W). After that microcontroller send the alert message to family member or EMS through GSM module which contain GPS parameter values. Motor stop automatically when alcohol is detected through alcohol sensor.

The Fig4 below explains how the system is work and shows the steps that the system follows at the operation. This system is programmed using Embedded C Language in ARDUINO software. Arduino software offers development tools for AVR (ATmega328) and debugger simulates the complete instruction set then code is burned into AVR controller.
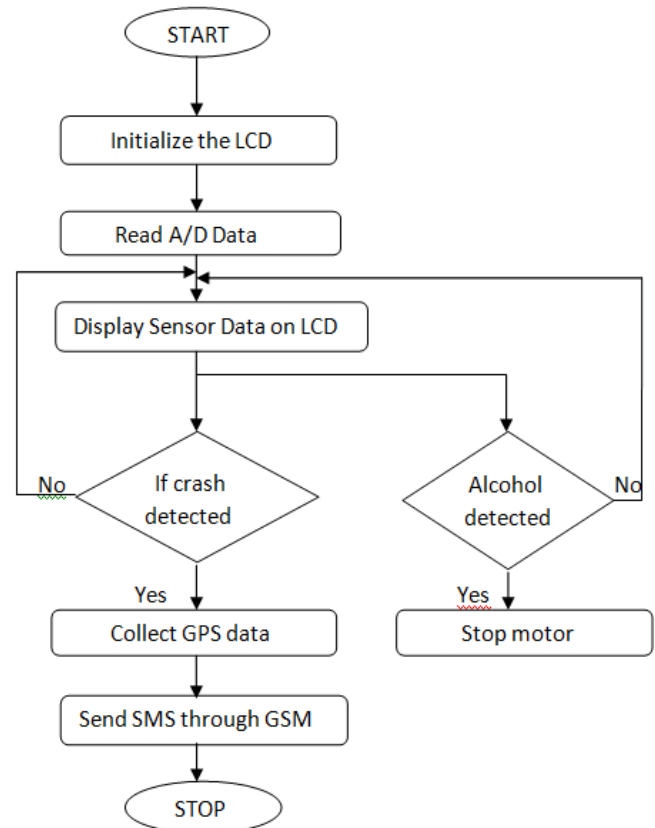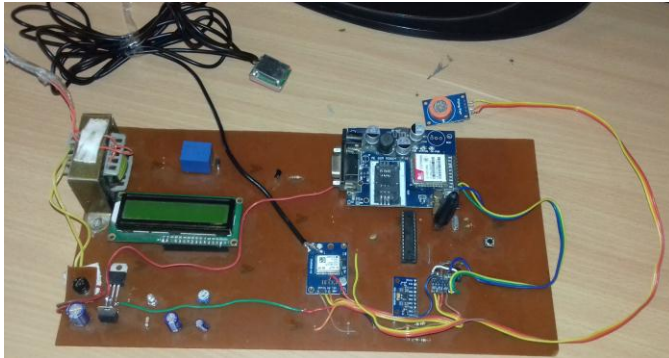

Fig4: Flowchart.

V. Working Model.

Fig5: Working Model.

VI. Result.

The mobile number of user should be include in software programming it order to receive accident location value from the SIM card, which we are using in GSM module. Motor stop automatically when alcohol is detected and display the message on LCD. The GPS will send the coordinates to microcontroller, GSM will send the message to recorded number, the message that will be sends is shown in Fig5.
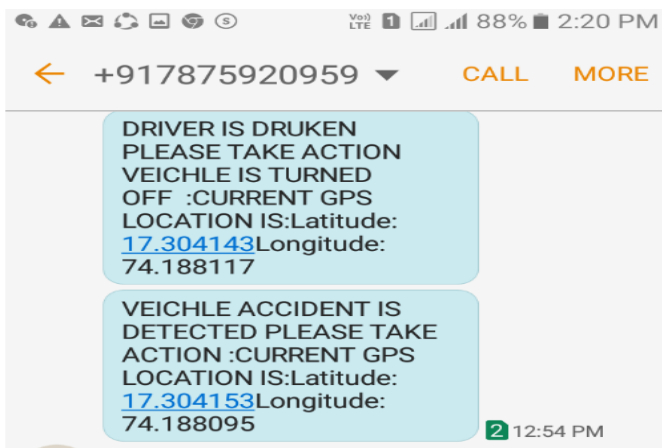

Fig6: Accident detection message.

VII. Conclusion and future work.

The proposed system is developed to provide the information about the accident occur and the location of accident. It helps to easily provide the assistant and help to victim of the accident. This system uses GPS module to locate the vehicle. GSM is used to provide the information of accident. The results of proposed systems are satisfactory. If the driver is driving took alcohol then motor will be automatically stop and which is displayed on the LCD.

Future this system can be implemented by using sound sensor, in order to make it more accurate and efficient to detect an accident. This is extended with alcoholic detection also. If the person who is driving took alcohol then the vehicle will be stopped immediately by giving alarm. This can also be developed by interconnecting camera to the controller module that takes the photograph of the accident spot makes tracking easier.

We found the location of the accident but there may be chance that the traffic jam will be high in that path. So we need to come up with some algorithm which gets the nearby the hospitals with minimal distance and traffic. We may add some modules which will also let the system know about the traffic details and then find out which node will take less time to reach from the accident spot.

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