Smart Highway Technology using Intelligent Black Box for Vehicle Accident Monitoring

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ABSTRACT
The main aim of this paper is a development of prototype Vehicle Black Box System (VBBS) which can be installed into any vehicle like car, two wheeler, and any other vehicle all over the world. This system can be designed with minimum number of circuits. The Vehicle Black Box system can play a good role in constructing safer vehicles, when the accident is occurred for treatment of crash victims, helps insurance companies for their vehicle crash investigations, and increases highway status in order to decrease the death rate.

KEYWORDS: Black Box, ADXL335, GPS, GSM modules, Vibration Sensor, Vehicle

1. INTRODUCTION

One of the most important issues in the world is the road accidents. Over one million people die every year Because of transportation related accidents, according to WHO. So to decrease the rate of road accident and to increase the safety of human lives, various vehicle manufacturers have taken several steps to improve the safety of the vehicle, the problem remains for the above reasons. In road accident death rates are high, because of time delay for treatment of crash victim. Causing economic and social burdens for people involved. So here we used the technology of black box like air craft used data recorders on a plane. Nowadays "black box" technology plays important role in vehicle accident investigation. It is the electronic device, which is used to record and store information in particular. Same concept used for motor vehicles, by implementing a black box in the car for help.

So we used the black box for record and store vehicle data in real-time, Gives acceleration, speed, vibration, interruption values in real time and store this value and vehicle's driving history. We can track and monitor the driving conditions of the vehicles and also the accidents. The analog to digital converter (ADC) are used to collect analog values collected by the sensors and convert the min to a digital value to feed into the microcontroller. On the time of accident it gives massage to family members of victim and one massage is to nearer hospital, hence in these this we can early treat the crash victim as well as helps the in the investigation of accident. The main aim of these paper is made zero death rate. If we are able to collect Data in real time all over the globe the accident are occur recover fast in very short time, it increase fast recovery of accident victims and reduce the severity of injury. In this, we used accelerometer sensor and vibration sensor for detection of accident.

2. HARDWARE DESCRIPTION:
The hardware part consists on the sensors and the black box installed in to the vehicle.

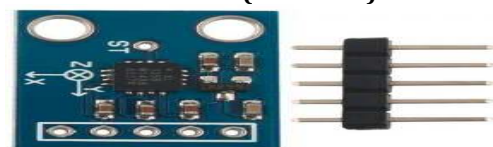### A. Accelerometer Sensor (ADXL335):

Fig.1

The accelerometer sensor is used to find the angle of tilt of a car or any other vehicle during any accident or in some improper roadways. This accelerometer sensor records the value in term of an angle of tilt. This recorded value i.e. angle of tilt is fed to microcontroller unit each and every time. In this we decided a limit of angles. It means if the threshold range is 135 degree in a clockwise direction and 180 degrees in an anticlockwise direction, if car tilts less than 135 degrees and tilts greater than 180 degrees then the car would be in danger or the is not in safe zone.

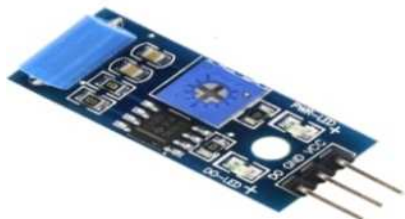## B. B. Vibration Sensor :

Fig: 2

In this we used the vibration sensor (SW-420) which have high sensitivity, non-directional vibration sensor. The default state of the switch is close. It's digital output supply voltage is 3.3v-5v. It's on board LED is as a indicator to show the results. When the module is stable the circuit will be briefly disconnected and output low SW-420 based sensor, when the module is unstable it shows high output then the car would be in unsafe zone.

C. GSM Module :

Fig: 3

GSM module is used to detect the location of Vehicle when the accident of Vehicle is detected, for the safety of the vehicle, it is program to track the location of vehicle. The location of the accident vehicle is sent to registered telephonic number through GSM. Using Google map the details sent by GSM locate the accident spot.

D. GPS Module :

Fig:4

We know on earth every point has unique address so to track any and exact location on earth there are 24-32 GPS satellite are use. These GPS satellites are continuously transmits a GPS signal via radio waves in microwave part and broad cast a navigation massage. All satellites broadcast at 1575.42 MHz (L1 signal), and 1227.6 MHz (L2 Signal). So in this project we use these to locate the vehicle accident.
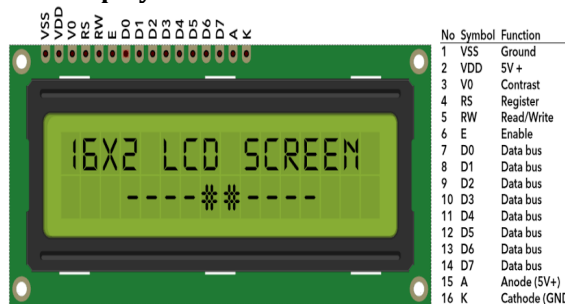
E. LCD Display :

Fig: 5

The 16*2 LCD is used to display current longitude and latitude it have features:
- It is flat panel have visual display
- It have no limitations of displaying special and even custom characters

In this paper, we used 16×2 LCD display received the information collected from microcontroller and display the massage on screen.

F. Microcontroller ATmega328

Fig :6

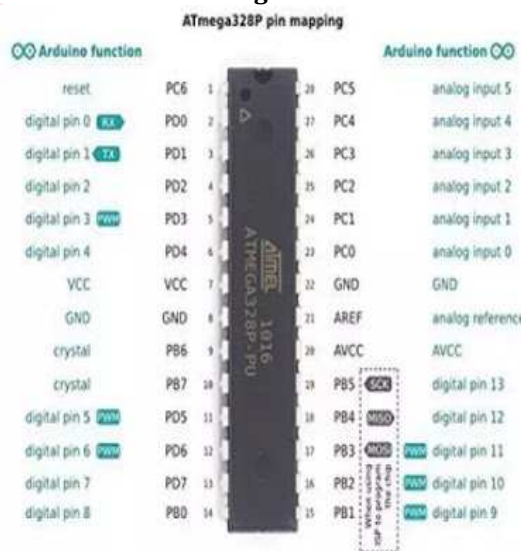## 3. SOFTWARE DISCRIPTION (ARDUINO IDE):

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more, each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.
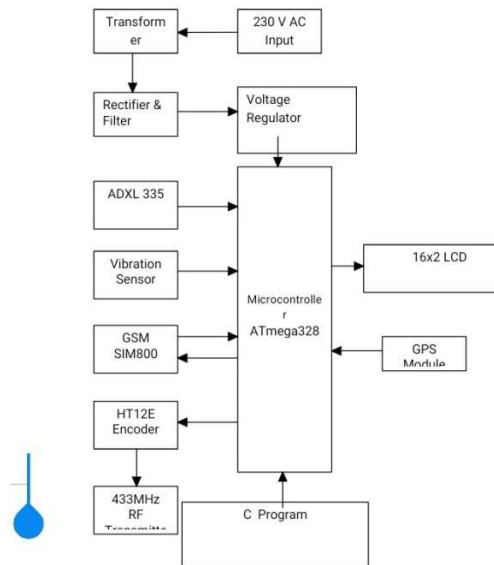
4. BLOCK DIGRAMOF BLACK BOX:

Black Box :

Fig: 7

OPERATION OF BLACK BOX SYSTEM:

In this paper we present the proposal of wireless black box for detection of accident, reduce the death rate during accident and helps for investigation of accident. In this wireless black box we used MEMS accelerometer, vibration sensor, GPS tracking system, for over all monitoring. The system also consist cooperative components like microcontroller unit, LCD display, GPS and GSM modules. At the time of accident, ADXL335 which is our main sensor detects the orientation of Vehicle where it tilts above the maximum limit or below minimum limit. When its orientation is change, the accident is detected. If the accident is occur the GSM & GPS wireless device are send short message indicating position of accident by tracing the location of Vehicle. The message is sent to family member or one massage is to nearer hospital, so in short time we can inform hospital or emergency medical service as well as victims family member. And also the sensors like accelerometer and vibration sensor are helpful in accident investigation for insurance companies. The main objective of this paper is to reduce the human death rate during accident. The system is able to give quick response if accident is detected, without any time delay. The fall detection and reporting system for the vehicle is gain attention because the system includes ADXL335 accelerometer sensor.

5. RESULT:

The result shows prototype Black box system for vehicle in which the system configuration is included. Mobile screen shows the massage which contains location of vehicles during accident.

Fig 8: Black Box system connection

Fig 9: system Output

Fig 10: Prototype System

6. CONCLUSION

The proposed system makes good use of GPS and ADXL335 sensor, vibration sensor. It gives the safety to travelers during travelling. The human deaths are reduced by this safe and secure system. It helps to find the current location of the vehicle. It is the traveler's safety mechanism. As per traveler's safety concern, the proposed system also gives massage to family members and also hospital telephone number so that in short time treatment is given to crash victim

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