

Smart Vehicle Black Box

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Abstract: Millions of people die due to the accidents every year. In order to overcome this problem, we are trying to implement the concept ‘Smart Vehicle Black Box’ which will not only prevent the accidents but also look over the safety of the driver and the vehicle. This is designed with minimum number of circuits. Essentially, it monitors and records the data and provides an analysis as feedback to the driver to be alert by displaying data and sends the data after the accident to other parties. It records data such as presence of obstacle (distance between vehicles), alcohol content, drivers driving license, and tracking of live location of vehicle and time. This recorded data can be used for forensics, revealing the problems that caused accidents which helps the police investigation. The main objective of this project is to made less accidents level in real time and if accidents occurs to recover to recover fast in very short time.

Keywords: accidents, black box, investigation, vehicle, safety.

1. Introduction

A vehicle accident is one of the most important issues around the world. Although various vehicles manufactures have taken several steps to improve the safety of vehicle. But due to delay in medical aid, death rates are more. Like aircraft data recorders in a plane ‘Black Box Technology’ which we are trying to implement a concept for vehicles plays a major role in vehicle accident investigation.

Most of accidents occur because of not maintaining a proper distance between them and drunk driving is also major reason for accidents. In spite of this, stolen vehicle becomes problem. All these problems are solved by this ‘Smart Vehicle Black Box’.

The black box is an electronic device which is used to record, store and send information in particular which includes different types of sensors to detect the faults and GSM, GPS to detect location, time and to send message.

2. Literature Review

Smart vehicle black box system helps to find out the cause of the accident and needed information related with that accident and that information will be useful for the investigation. Not only during accident will this black box but also help the driver to be alert during critical conditions. A model consists of different sensors which will help out to find all such

information.

The purpose of designing vehicle black box with the GPS and GSM is a very simple and efficient way for positioning and tracking. This wireless communication by transmission of message in event of collision along with the time and location to the other parties like RTO, police station, family members, hospital etc. so that they can take a quick action.

The better crash research that may produce improved driver education programs and improve highway safety. It also detects the behavior of the driver. All the work contains many solutions for vehicular and driver safety.

3. Block Diagram

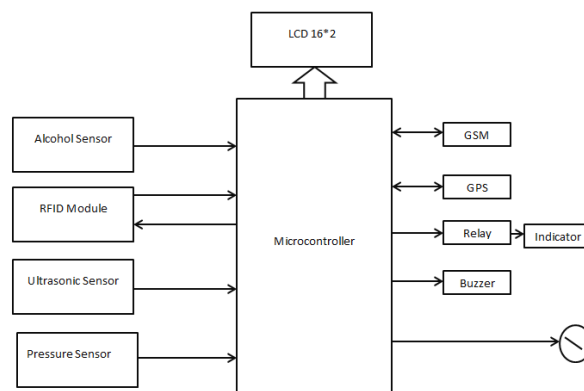


Fig. 1. Block diagram of black box

Figure 1 shows the block diagram of Smart Vehicle Black Box. The main part of the device is microcontroller, we can say it the heart of the project. It also consists of various like alcohol sensor, RFID module, ultrasonic sensor and pressure sensor. Then it consists of other parts like GSM, GPS, buzzer, indicator and relay. Functions of different blocks are given below in hardware description.

4. Hardware Description

A. Microcontroller

Here we are using Microcontroller AT89S52 comes from the 8051 family of Atmel microcontrollers.

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Features:

- 32 programmable I/O pins
- 8K Bytes of Programmable Flash Memory
- 256*8-bit Internal RAM
- Operating Frequency: 0 Hz to 33 MHz
- Operating Voltage Range: 4.0 V to 5.5 V
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Low Power Mode and Fast Programming Time

In our project, the output of alcohol sensor, ultrasonic sensor, pressure sensor and RFID module is given to microcontroller AT89S52 and according to command the message will go to LCD and the data is displayed on that LCD screen. Also after accident microcontroller gives command to send to GPS, GSM to send messages to other parties.

B. LCD

A Liquid Crystal Display (LCD) is an electronic visual display based on Liquid Crystal Technology. Here we are using 16*2 LCD. It has 16 pins, in that 8 pins are Data pins and remaining 8 pins are Command pins. LCD Module is inexpensive, simply programmable, no limitations for displaying characters. Its operating voltage is 4.7 V to 5.3 V and the utilization current is 1 mA. The use of LCD is to display all the parameters on the screen such as alcohol content drunk by the person i.e. if person is drunk or not, distance between two vehicles and to start the vehicle or not.

C. Alcohol Sensor

We use MQ-135 alcohol sensor sends signal to detect alcohol content. It is high sensitive to alcohol, simple drive circuit, stable, fast response and long life. If the driver has drunk, then alcohol sensor sends signal to microcontroller. The output of MQ-135 is given to microcontroller and message is displayed on LCD. If driver is drunk it will display 'Yes' and if driver is not drunk it will display 'No'.

D. RFID Module

RFID (Radio Frequency Identification) uses electromagnetic field to automatically identify and track tags attached to objects. And it leverages low-power radio frequencies to collect and store data. The RFID tag receives the message and then responds with its identification and other information. This is only a unique tag serial number. After the accident, this would help the investigator to find out the person who was driving the vehicle.

E. Ultrasonic Sensor

Ultrasonic sensor (HC-SR04) is used for measuring the distance between two vehicles i.e. presence of obstacle. It measures distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the obstacle. It measures the distance to the obstacle by measuring the time between the emission and reception. The formula for measuring distance between vehicle and obstacle is,

$$\text{Distance} = \text{speed} * \text{time}$$

F. Pressure Sensor

Pressure sensor is a device for used to sense the collision. In this project, pressure sensor is mainly used for accident detection. When force or pressure applies to the switch, an electric charge is generated. This can be measured as voltage proportional to the pressure. A static force results in a corresponding charge across the switch.

G. GPS

Global Positioning System determines location and time of the vehicle during or after the accident in real time application in all weather, anywhere on the earth. It determines location of vehicle by comparing the time signals it receives from a number of and triangulating on the known positions of each satellite. In our application the GPS tracks the latitude and longitude of the vehicle and send to the cloud for easy tracking.

H. GSM

Global System for Mobile communication is a device used to send messages via SIM. The working of the GSM module is totally AT commands. It is programmed in such way that whenever the accident is detected, the exact location of vehicle and an alert message will be send to the registered mobile numbers through GSM and all the sent details can be used to locate the vehicle.

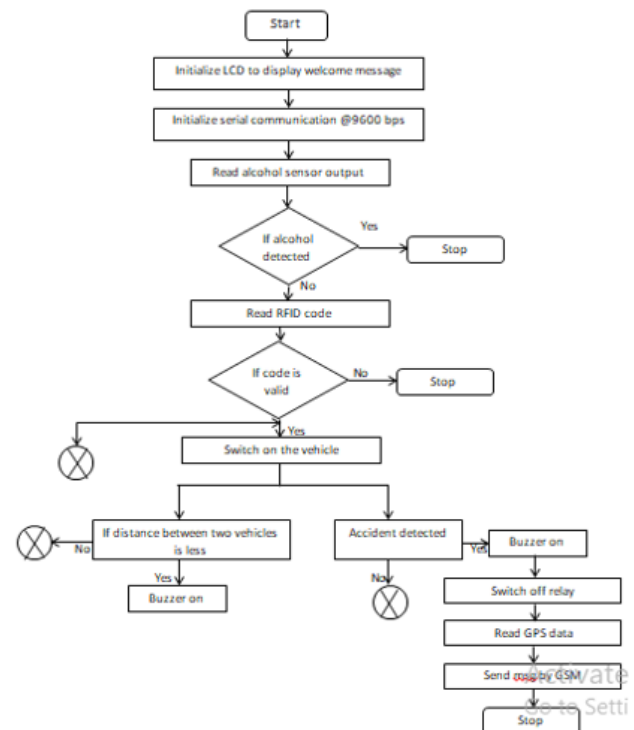


Fig. 2. Flow chart of proposed system

I. Power Supply

Here we require 5V DC power supply for almost all the components. But we have 230V AC supply, so following is the block dig used to convert 230V AC to 5V DC. Firstly, step down transformer is used which will covert 230V to 9V AC and then rectifier is used for converting AC to DC. To reduce ripple

factor of output DC we require filter and then voltage regulator to regulate DC supply output.

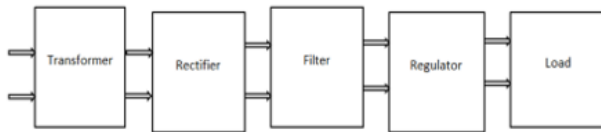


Fig. 3. Block diagram of power supply

5. Conclusion

By using Black Box system constant motoring of driver's driving, condition of vehicle is checked and also the location of vehicle is traced all time. Therefore, it gives safe and secure traveling to the travellers. Because it solves all the problems related to driver as well as the vehicle. This Black Box can be fitted in any vehicle. This Black Box is reliable, useful in the real time application.

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