International Journal of Research Publication and Reviews

Vehicle Black Box System

Mr. S. R. Patil, Mr. A. S. Patil, Mr. S. A. Koli, Mr. B. S. Kamble, DR. S. J. Patil

Department of Electronics Engineering
DKTE Society's Textile and Engineering Institute, Ichalkaranji.

ABSTRACT-

Automobiles and computing technologies have created a new level of data services in vehicles. The Automobile Black Box has functions very similar to an airplane black box. It is used to analyze the cause of vehicular accidents and to prevent the loss of life and property arising from the vehicle accidents. This project proposes a prototype of an Automobile Black Box System that can be installed into vehicles. The system aims to achieve accident analysis by objectively tracking what occurs inside the vehicles. The system also involves enhancement of security by preventing tampering of the recorder data. The Arduino controllers are used to regulate the sensors. The main purpose of this project is to develop a prototype of the vehicle black box system that can be installed into any vehicle all over the world. This prototype are often designed with minimum number of circuits. This results in constructing safer vehicles, improving the treatment of crash victims, helping insurance companies with their vehicle crash investigations, and enhancing road status so on decrease the death rate. This project discusses the configuration and functions of the Car Black Box System. It also focuses on monitoring of real time driving and also records and saves the monitored data for further investigation in the case of an accident. This system helps the accident investigators as well as insurance companies to find out the cause of the crash. . Other features such as navigation, speed tracking and Alcohol detection are also provided in the system. The perspective of this project is to form the user feel more safety about the car and to assist knowing the explanation for accidents if any.

Components list-

- ➢ Microcontroller ATMEGA 32A
- ➢ 16*2 Liquid Crystal Display
- ➢ GPS module
- ➢ GSM module
- ➢ EEPROM
- ➢ Sensors
- ➢ Motor driver L293D

Introduction-

According to the World Health Organization, more than a million people in the world die each year because of transportation-related accidents. In order to react to this situation, the black box system draws the first step to solve this problem that crosses national boundaries and threatens the safety and health of people worldwide. Introduced to a part of the United States market in 1999, the black box system proved to be efficient. However, in the latter case, the system was embedded in the vehicle. Therefore, in addition to improving the treatment of crash victims and the road status in order to decrease the death rate, constructing safer vehicles, and helping insurance companies with their vehicle accidents investigations, the main purpose of this paper is to develop a black box system that can be installed to any vehicle all over the world. Like flight data recorders in aircraft, "black box" technology can now play a key role in motor vehicle crash investigations. A significant number of vehicles currently on the roads contain electronic systems that record information in the event of a crash. That is why it is so important to have recorders that objectively track what goes on in vehicles before, during and after a crash as a complement to the subjective input that is taken usually from victims, eye witnesses and police reports.

This system is committed mainly to two approaches. The first one is how to detect and record data from the vehicle. The second is how to present the data recorded to the user in a simplified way. To implement the first approach, some major components and different type of sensors were used. While the second approach was implemented using a Visual Basic .NET computer program. This program receives the data serially from the black box memory, presents it in real-time graphics and finally saves it to a formal excel report for future use. In order to know what type of sensors should be installed into the vehicle, research was carried out to identify the main information needed for better accident analysis. After filtering the information and taking into consideration what could be done and what could help the most, the following data were found to be the most important ones needed after an accident:

Belt status, Road condition, Brake status, Speed Measurement, Position of the accident, Main Lights status. In this paper, we describe in section II the hardware resources dedicated to VBBS system. The software part is subject of the section III. Finally, a conclusion is given in section IV.

Scope of Project-

1. Accident investigation: The data recorded by a black box can provide valuable information about the events leading up to an accident, such as the speed of the vehicle, whether the brakes were applied, and the position of the steering wheel. This information can help investigators determine the cause of the accident and assign responsibility.

2. Vehicle safety: By analyzing data from a large number of black boxes, manufacturers can identify safety issues and design better safety systems. For example, if a large number of black boxes show that airbags failed to deploy in a certain type of accident, manufacturers can use that information to improve airbag systems.

3. Insurance: Some insurance companies offer discounts to drivers who agree to have a black box installed in their vehicle. The data recorded by the black box can be used to assess a driver's risk profile and adjust their premiums accordingly.

4. Maintenance: The data recorded by a black box can be used to identify mechanical issues with a vehicle. For example, if the black box records that an engine misfired at a certain speed, a mechanic can use that information to diagnose and fix the problem.

5. Law enforcement: In some cases, the data recorded by a black box can be used as evidence in criminal cases. For example, if a black box records that a driver was speeding at the time of an accident, that information can be used to prosecute the driver for reckless driving.

Overall, the scope of a vehicle black box system is to provide a valuable source of information about a vehicle's operation that can be used for a variety of purposes, including accident investigation, vehicle safety, insurance, maintenance, and law enforcement.

Unique features of the project: -

- Avoidance of Accidents.
- Decrease in disturbances to Schools & Hospitals.
- User safety.
- Avoidance of wear and tear of vehicle
- Cost Effective

Working Mechanism:

From the reference of above figure 3.2, Car black box records three different things i.e., information about the driving data, collision data and the position data. Driving data includes status of the vehicle while driving by various sensors and stores in its memory. Collision data includes the date and time when the collision has occurred with the help of real time clock and the recondense of the vehicles speed. Position data includes the exact location in terms of latitude and longitude values where the vehicle met with accident with the help of GPS module, this driving data and collision data is sent wirelessly to the nearest emergency medical service/ relatives through GSM module. The ultrasonic sensor which is placed at the front part of the vehicle continuously scans the lane for detecting the obstacle or vehicle. If such an obstacle is found, the system determines whether the vehicle is in danger of crashing, and if so, a collision warning is given to the driver. It is constructing with help of Ultrasonic Sensors which measures the distance between the vehicles. The sensor determines distance between vehicles continuously and displays the measured value on a LCD. Here the accident sensor is vibration sensor. Usually when collision occurred some sort of vibrations will be experienced by the vehicle, so this vibration will be sensed this sensor and information will be sent saying accident has occurred. The 4 SPDT (single pole double throw) switches which are placed at the 4 corners to know the direction of accident. If anyone of the switch has got pressed the GSM module sends the message to pre-saved number saying accident occurred. Alcohol sensor is highly sensitive to alcoholic smell. If the alcohol smell is detected in drivers' cabin, the ignition is turned off and then signal is sent to microcontroller. Temperature sensor (LM35) frequently monitors the engine temperature. If this temperature level exceeds the threshold values, then the system alerts the driver by buzzer and offs the ignition system, and even the information about this engine temperature will be recorded. MQ7 gas sensor is highly sensitive to the content of CO_2, If the content the variety of CO_2 from the smoke emitted exceeds the desired threshold levels, then sends the signal to microcontroller. Vehicle speed is measured based on the rotation of the wheels in the designed module in terms of RPM. Float sensor is fixed inside the fuel tank. If the level of fuel decreases, driver will be intimated through buzzer. The information from every sensor will be recorded once in every 5seconds. If these values vary the desired limit, then the driver is made alert through buzzer and by displaying information on LCD.

Methodology-

The prototype model of automatic vehicle accident detection and messaging using GSM and GPS modem using ARM7 working will be made in the following manner: Complete layout of the whole set up will be drawn in form of a block diagram. Initially designed module will be fixed inside the vehicle. An accident detection sensor or the accident switches used will first sense the occurrence of an accident and give its output to the microcontroller.

The various sensors connected will sense for the different parameters and give its output to microcontroller and this information from sensors will be recorded and stored in the memory. The GPS detects the latitude and longitudinal position of a vehicle where exactly the accident occurred and this information is sent through GSM to the pre-saved numbers so that they can take an immediate action to provide rapid service for treatment and rescue. If any of the sensor values varies the threshold values, then driver is alerted by the buzzer and parameter values will be displayed on LCD. Later the stored information from black box can be used for replay of the accident and analysis

Block Diagram-
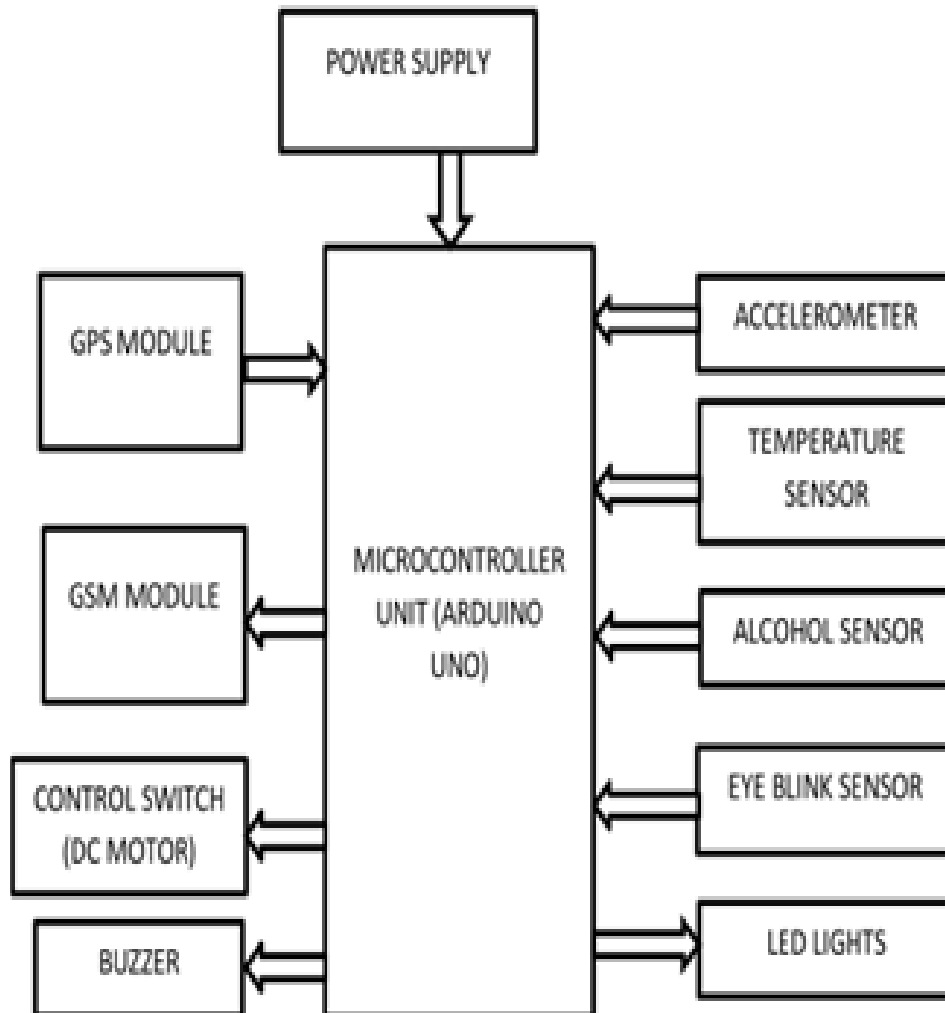
Flow Chart:
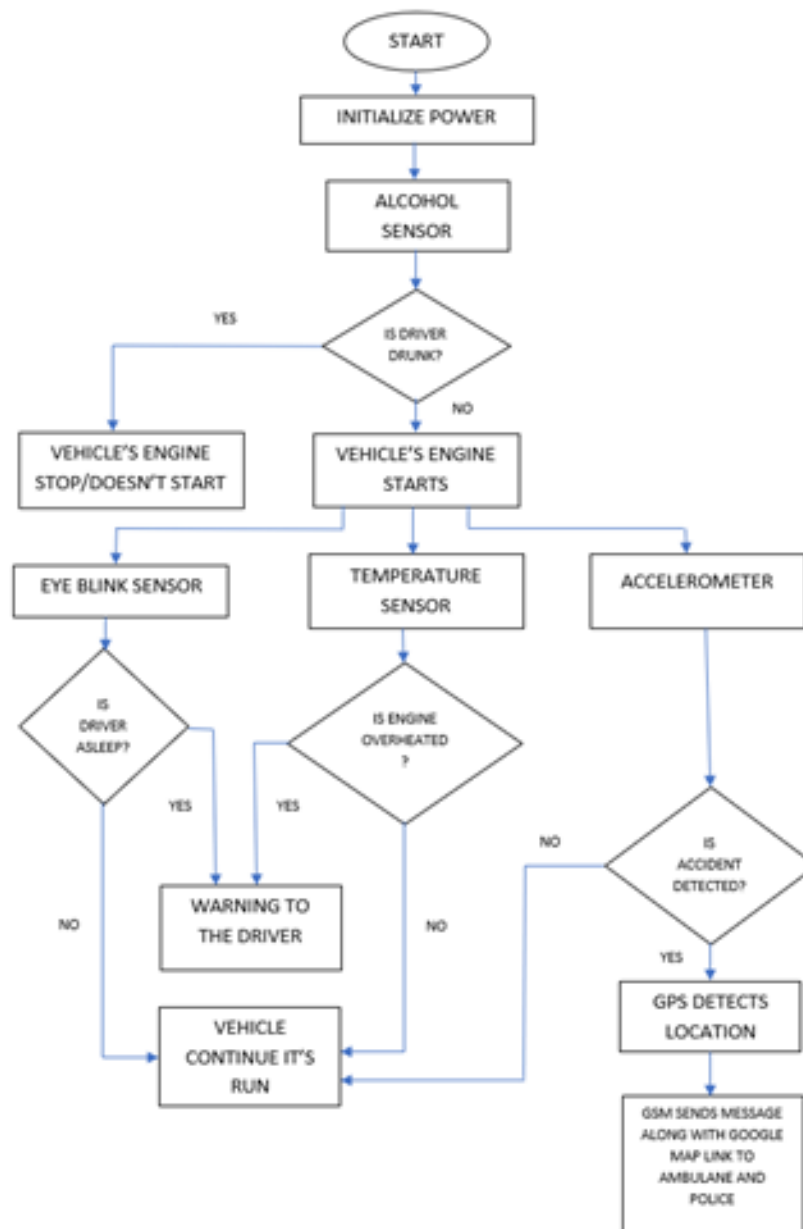
Result-

All the hardware components used in the integrated system for the project "VEHICLE BLACKBOX" have been developed. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The objectives of the project that is the Speed, the position of the vehicle where the accident has taken place and check if alcohol was present or absent during the time of accident. This Car Black Box Application aims to help Accident Investigators and Insurance Companies to perceive the cause of the accident; this should help investigators to speed up their investigation process and provide fast results. After the accident is occurred then every detail of sensor is calculated and stored in memory. These values are very useful to know How the accident is occurred. The proposed system would serve as an effective source of information at the event of an accident. When any type of accident occurs due to any reason, the vehicle's black box provides necessary information and the data to generate the report of accident and about its causes. This project has offered a user-friendly program to analyze the data of the accident and this can be implemented on any vehicle. Following figure is the result
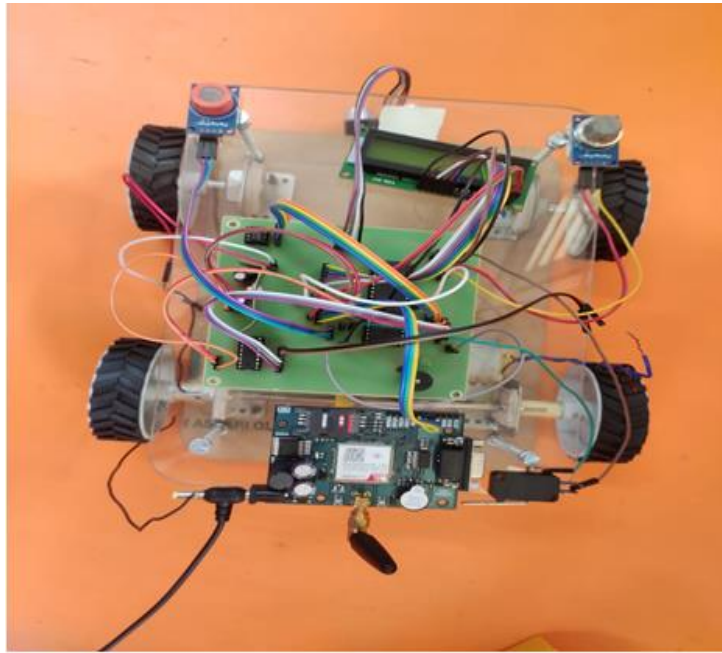
Conclusion-

This project presents a black box system that is very useful for automobile industry. An innovative black box is developed using various sensors like steer touch sensor, hall effect sensor and an android app that contains features of audio/video and GPS/GSM. Whenever the driver is driving car, the system will begin to save the parameters and display it on LCD screen. This system also gives alarm to the driver for abruptness occurred during driving the car. In case of accident the video at the time of accident will be recorded and message will be sent to control room that includes location of accident and the parameters recorded at the time of accident. This design of black box is very useful to resolve many disputes related to accidents.

References-

 [1] G. Hayes, F. Blosser, "Motor Vehicle Crashes Claim More than a Million Lives Worldwide", CDC Injury Center Media Relations, Press Release, April, 2004.

[2] Thomas K. Kowalick, "Black Boxes: Event Data Recorders", MICAH, summer 2005.

[3] Thomas K. Kowalick, "Black Boxes: Event Data Recorder Rulemaking for Automobiles", MICAH, summer 2006.

[4] Thomas K. Kowalick, "Fatal Exit: The Automotive   Black Box Debate", Wiley, IEEE Press, Feb. 2005.

[5] J. Lawrence and T. Newbery, "Crash Data Recorders in Motor Vehicles", MacInnis Engineering, Associates, 2003.

[6] Chidester, Augustus, et al, "Recording Automotive Crash Event Data", International Symposium on Transportation Recorders, Arlington, VA, 1999.

[7] L. Dae Geun, J. Se Myoung, L. Myoung Seob, "System on Chip design of Embedded Controller for Car Black Box", Intelligent Vehicles Symposium IEEE 2007, pp. 1174-1177, 13 June 2007

[8] Gilman, Don. "Automotive Black Box Data Recovery Systems." Digital Negative. TARO (The Traffic Accident Reconstruction Origin) 15 (2006).

[9] M.A. Martinez, A.C. Kak, "PCA versus LDA", IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 23, no. 2, pp. 228-233, Feb. 2001