Evidence Collection in Vehicle through Black Box Using Arduino Mega

Cheemakurthi Yugesh[1], Chilakapati Yeshwanth[2], Chinthalapudi Vasudeva Rao[3], G.Neelavathi[4]

Students, Mahendra Engineering College, Tamilnadu, India [1,2,3]

Asst. Professor, Department of ECE, Mahendra Engineering College, Tamilnadu, India [4]

ABSTRACT-Black Box refers to collection of several different recording devices. Vehicle Black Box is an "Event Data Recorder". Black Box records the relevant details about a Vehicle such as Engine Temperature, Distance from obstacles, Speed of Vehicle, Detect vibration of the vehicle and also detects orientation or inclination of Vehicle. The design select ARDUINO MEGA (Atmega2560) as embedded controller, UART is the common peripheral found microcontroller widely used for GPRS module and GPS module. Vehicle Black Box is a device to record driving history which can be used for Vehicle forensics in case of Vehicle accident or related crimes. Black box stores vehicle data that could be critical clues for investigating Vehicle-related accidents or crimes. Those data can be collected to police server via IOT infrastructure that provides Wi-Fi or GPRS connections. Especially, smart phones are very useful for this purpose.

I. INTRODUCTION

The vehicle accident is a major public problem in many countries. This problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding without sufficient sleep etc. Vehicle black boxes is having logical feature considering that more people are dying in Vehicle accidents than an airplane crashes. The causes of Vehicle accident are not too difficult to investigate as plane crashes but there are cases that are very difficult to solve due to contradictory stories of driver. Black Box in aircraft help to determine the cause of an airplane accident where as Vehicle black box helps to determine what has caused a Vehicle accident. They are particularly valuable when no witness are present at the scene of accident and when each drivers has his/her own version of event. Vehicle black box is digital electronics device, which records and store vehicles speed, vehicle location, vehicle temperature, vibration, distance from obstacles, real time and other vehicle status information. It help to discover and to analyze the reason of an accident easily and to settle many disputes related to Vehicle accident such as crash and insurance settlements. Data is record using SD card.Kassem, et al. [1] The Automobile Black Box has functions similar to an airplane black box. It is used to analyze the cause of vehicular accidents and prevent the loss of life and property arising from vehicle accidents. C.Nagarajan et al [1,2,3] has studies This paper proposes a prototype of an Automobile Black Box System that can be installed into vehicles. The system also involves the improvement of the security by preventing the damage of the Black Box data. iang, et al. [2] Vehicular environments impose a set of new requirements on today's wireless communication systems. Vehicular safety communications applications cannot tolerate long connection. Establishment delays before being enabled to communicate with other vehicles encountered on the road. Similarly, non-safety applications also demand efficient connection setup with roadside stations providing services (e.g. digital map update) because of the limited time it takes for a car to drive through the coverage area.

As per News18 report, almost 1.5lakh people lost their live in road accidents alone in the year 2017, which means on average of 53 accidents happens every hour in that 17 deaths per every hour due to these accidents.This statistic makes me to think about how to reduce accidents, then I got this project.
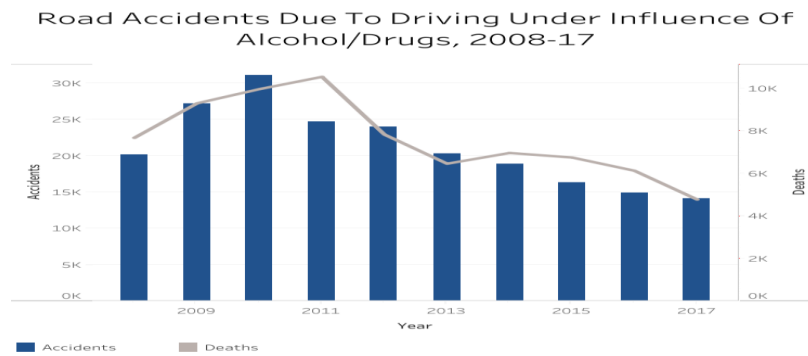
Fig 1 Graphical representation of accidents and deaths due to Alcohol
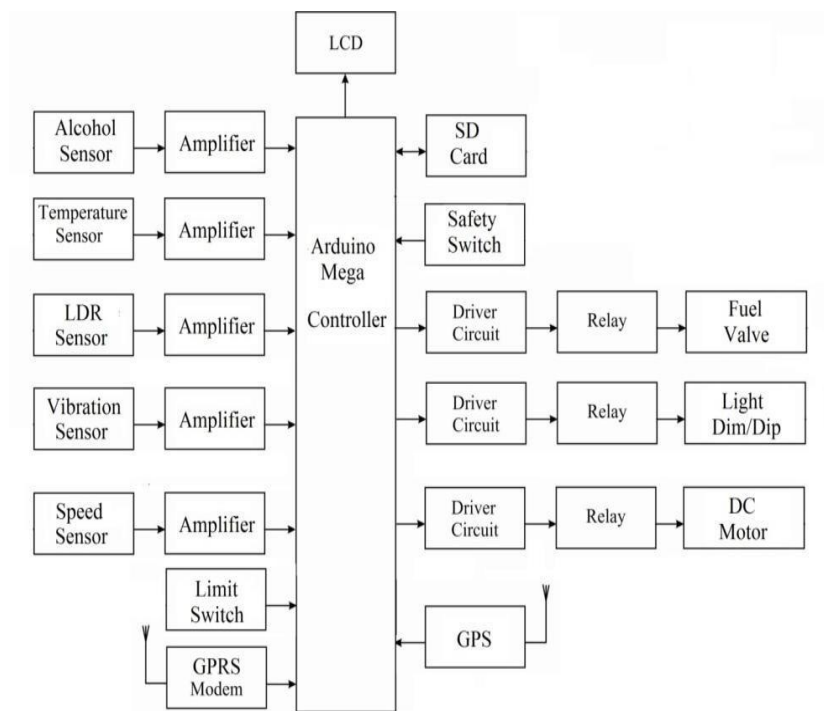
Block Diagram

Fig.2 Block diagram of proposed system

II. HARDWARE REQUIREMENTS

ARDUINO ATmega 2560

Overview The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16

MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

LCD Display
A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. It is used to display the alerts and readings of sensors.

Sensors
A variety of sensors are used for various purposes in the Black Box. Alcohol sensor used to sense whether the driver or other passengers are drunk. Speed sensor is used to sense the speed of the vehicle. Vibration sensor use to sense the range of vibrations at the time of accident. Temperature sensor is used to sense and record the temperature around and inside the vehicle. LDR sensor is a resistor whose resistance decreases with increasing incident light intensity. It can also be referred to as a photoconductor.
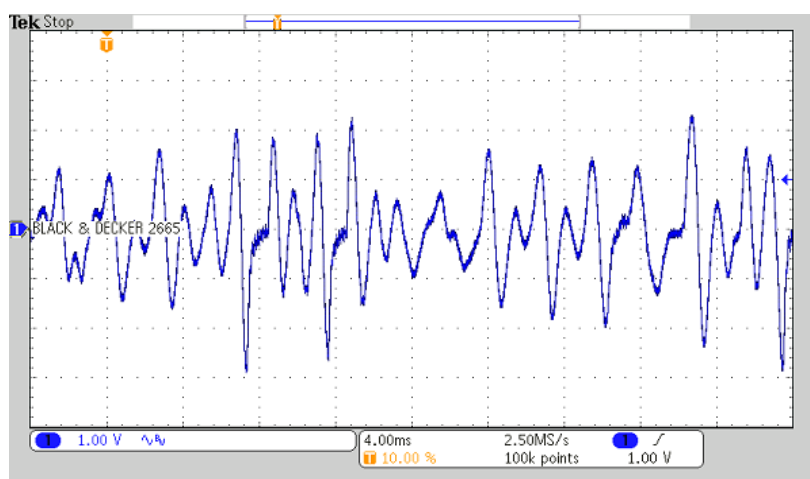

Fig 3.Vibration sensor output

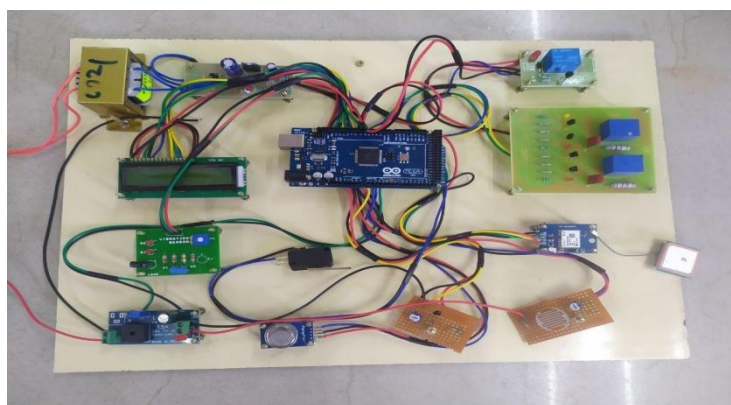
Fig 4 Arduino Alcohol Sensor Circuit

Fig 5 project prototype

These are all the tested components and outputs. All these are tested separately, and at last all are connected and fixing in a single box or cardboard as for our convenience. Most of the sensors having analog outputs and those are very minute which cannot be identified by arduino. So we are using amplifiers.

III. HARDWARE IMPLEMENTATION

Arduino mega is the main part in evidence collection in vehicle using blackbox system. In order to implement this evidence collection in vehicle using blackbox system we need the following crucial components. Vibration sensor, Alcohol sensor, Temperature sensor, Speed sensor, LDR, GPS, GPRS, relay by using Arduino mega we connect all the components together.In the physical setup all the sensors will collect the information and will send the information to the Arduino Mega by using amplifier the signal strength will get increased. Alcohol sensor will work in the range of 150ma to 5V it can easily detect the gases which will differed from the room temperature. Vibration sensor will work in a particular range if the car hits and object or other vehicle it will check the range of pressure applied if the pressure range is more then it will send the information to the controller. Temperature sensor is used to detect the temperature of engine and if the temperature is more than the initialized range it will send the information to the controller. GPRS will provide internet connection to the controller through cellular networks. GPS will send the location information to the controller and then the information will be send to police station, ambulance, and family members through SMS and notification alert.

IV. CONCLUSION

The main theme of the project is life saving. A survey states that on average of 1214 accidents takes place everyday in India. Main causes of accidents are Drunk N' Driving, speeding, Reckless Driving, Night Driving. The Vehicle Black Box system serve as an effective source of information at the event of an accident When any type of accident occurs due to any reason vehicle black box provides necessary data to generate the report of accident and about it's causes. This device has offered an user friendly program to analyze the data of the accident .This black box system built can be implemented in any vehicle .As soon as the driver runs the motors ,this system will begin to collect the data from all the sensors as stores in EEPROM with the data and time .The data saved can be retrieved after the accident for privacy purposes using serial transmission the EEPROM and display it to the user by using RS232 cable and MAX232 user. When accident happens it sends an alert to 108 (ambulance) and concerning pre-stored mobile number. And the alerting system implemented in this also avoids accidents by giving previous alerts to driver when anything suspicious goes on inside the vehicle. If this brings any change in this society, then it will be the recognition to my hardwork. Remember accident not only hurts a single person but also it reflects the whole family. So Drive carefully and avoid accidents.

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