AUTOMOBILE BLACKBOX SYSTEM FOR ACCIDENT ANALYSIS BASED ON RASPBERRY PI

Akash Kumar Gupta[1], M. Navya[2], A. Sekhar[3,] S.Suman kumar[4], M.Narendra Eswar Kumar[5]
[1]*Assistant Professor, Raghu Institute of Technology, Vishakhapatnam*
[2,3,4,5]*UG Student, Raghu Institute of Technology, Vishakhapatnam*

(E-mail: [1]akgupta452@gmail.com [2]navyasatish52@gmail.com)

Abstract: This paper describes conceptual information of a safety system for a vehicle using a black box system. This is mainly used to detect the detailed information about the crash and to take necessary preventive measures. The system can design by some basic circuits and some sensors. We have a special feature where it sends the message at any time, the vehicle meets with an accident in order to help or take preventive measures. The driving information (prototype), and the car functionality and different parameters of the car can measure by using different sensors. These sensors can record the total details about the car; they are the distance from the obstacle, accident direction, trip time, location and date. This design works based on raspberry pi processor. Finally, the total information of sensors is stored in SD card mounted in RPI for the brief analysis of the accident. We use different sensors like GPS (global positioning system) for indicating the particular location and camera is used for identifying the situation by seeing pictures and videos.

Keywords: Black box, GPS, GSM, data logging,

I. INTRODUCTION

Nowadays due to the riders poor behavior so many accidents take place, mainly in India this is the major public problem this problem is still increasing every year due to riders poor behaviors such as speed driving, drunk driving, riding without sleep etc…, the number of deaths and disability are very high due to the late assistance to people who meet with an accident due to this huge social and economic burdens are involved. On other side due to the drivers interruption and sudden break applied on cars accidents can take place, even though driver is a cognizant mind, then he cannot stops are applied breaks immediately then a serious accidents may occur, sometimes due to the bad weather, as mist, vapor, fog the crash will take place. Black box helps to display the preventative message for the driver on led and it records the data, it helps to decrease the death rate, and it is also called as the event data recorder and black box is an electronic device, Black store vehicle speed, time and location and information of sensors and it sends a short message indicating the vehicle position by GPS to the given numbers and nearest hospitals to provide the first aid as early as possible . The black box can help to find the reasons for an accident easily, and it can settle many disputes of car accident such as crash litigation insurance settlements.

II. AUTOMOBILE BLACK BOX SYSTEM

The functional block diagram of automobile black box system for accident analysis's shown in figure 1.the key components used in the module are Raspberry Pi, Analog to digital converter, ultrasonic sensor, temperature sensor, alcohol sensor, light sensor, seatbelt sensor, GPS, gsm, camera, vibration sensor, LCD display.
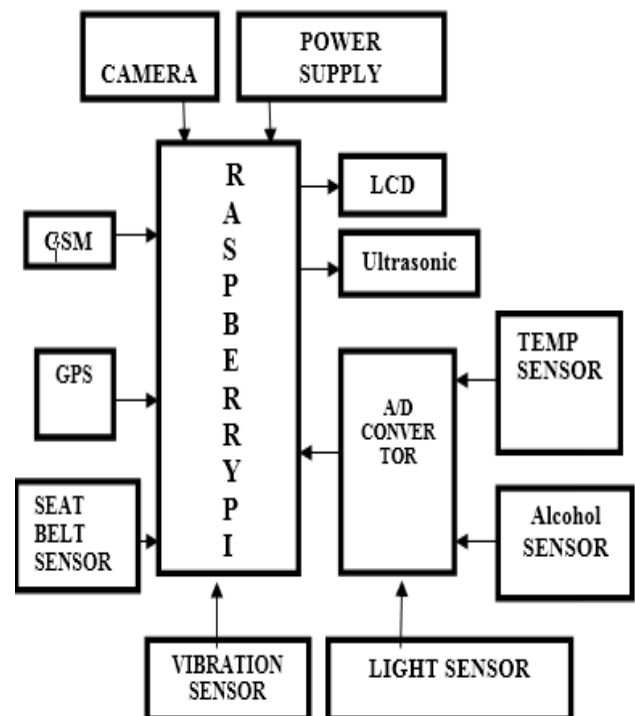

Figure: 1 block diagram of a black box

III.HARDWARE COMPONENTS

A. Raspberry pi 3model B: this is the third-generation raspberry pi, it replaced by the raspberry pi2 model in February 2016 and the newest version of raspberry pi3 model is placed in January 2017, it is the size of small credit card and it is open source; therefore, changes can be made to it whenever we required. Does not have storage drive but one can use SD card for sorting OS as well as or booting and long term process. This model runs on Rasping OS and this is programmed using python

2.7.6.and also we can install different software's, it consists four USB ports for external storage, 40 GPIO pins or connected with hardware and full HDMI port is available on this model board. It acts as the main controller of our system. It is just connected to the keyboard, mouse , display, power supply, micro SD card it is also installed in Linux distributions and you will have a fully-fledged computer the raspberry pi is directly connected to the system using the USB ports, and raspberry pi create the HD videos, you can even create the data, to capture and store the date and images the web camera is used and it is directly connected to board.   .

B. Seat Belt Sensor**:** it checks whether the driver wears the seatbelt or not if the driver didn't wear then it displays the message on LCD. And It Stores the data whether he/she wear the seat belt, At the time of accident takes place, and the data is recorded in EEPROM of the raspberry pi module or it can be also stored in the SD card attached to the raspberry pi.

C. Alcohol Sensor**:** It checks the alcohol level of the diver in the car and if alcohol consumption sensor reading exceeds the given threshold limit then it displays over consumption of alcohol in message on LCD "if there are any increases in the alcohol limit" and stores information of the driver at the time of the accident takes place, whether the driver alcohol consumed is above the range or not, it stores the data in SD card

D. Light Sensor**:** It checks the different lights in vehicle are the flashers, the brake lights, and the rear lights, here rear lights are used to detect the direction of vehicle and the brake lights are helping to show the status of the breaks to the rider, and flashers help to find that the driver can use it properly or not, and it stores all the data in the SD card to find analysis of the accident.

E. Distance Gauge Sensor**:** In distance gauge ultrasonic ranging module sensor HC-SR04 used, it detects the obstacle while the car is running, if an object approaches the car, and the sensor detect that obstacle, and stores the information in the SD card for the analysis of an accident.

F. Temperature sensor**:** This sensor checks the temperature of engine with respect to the heat of engine, if the engine crosses the threshold limit as we set value in car then it sends MSG on prefixed number" over temperature detected in vehicle" and it stores the total details in SD card about the engine at the time of accident.

G**.** GSM Module**:**

 GSM (Global System for Mobile Communications). This is used for digital mobile telephony system. The idea of GSM was developed at Bell laboratories in 1970, it transmits the mobile and voice operating at the 850mhz, 900mhz and 1900mhz frequency band, GSM module is the main important component to the system, It sends the SMS to the prefixed number if the vehicles meet with an accident. it establishes the communication between the mobile and black box system. By using the GSM, we send the message to the prefixed number and we insert the sim to the GSM module to track and detect the accident and by using that sim module it sends the message to the prefixed number.

IV.METHODOLOGY ADOPTED

The logical functionality of the black box system is shown in the flow chart in figure 2.
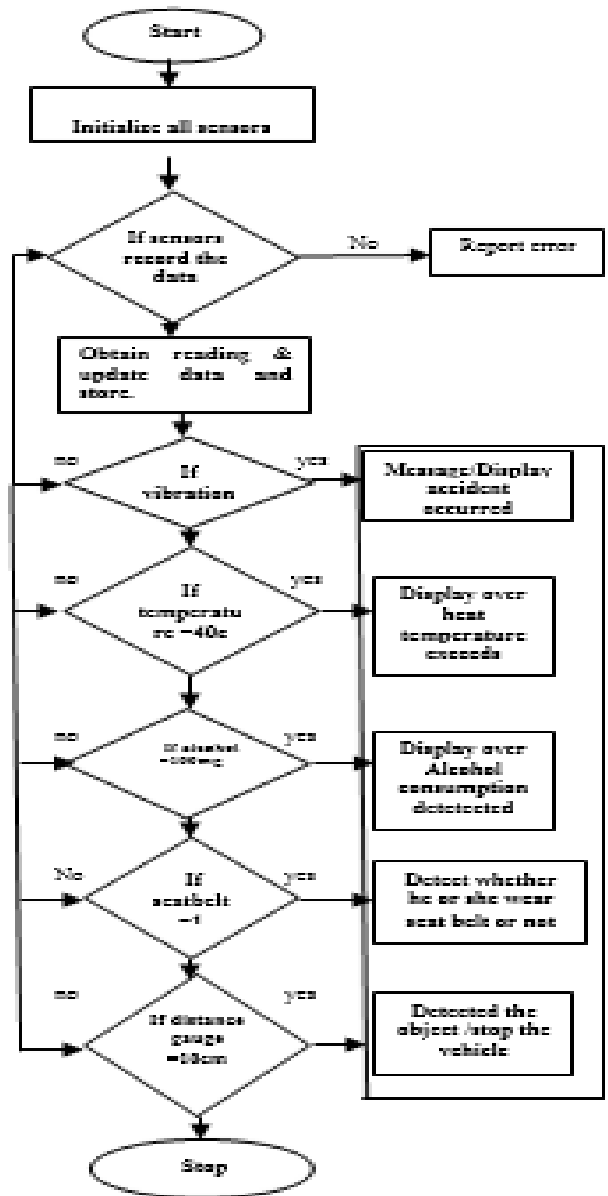

Figure2: the flow chart of the black box system

IV. BLACK BOX SYSTEM

The prototype of the Blackbox system is shown in figure 3.It consists of Raspberry pi with various sensors like temperature, Ultrasonic, vibration sensor etc.
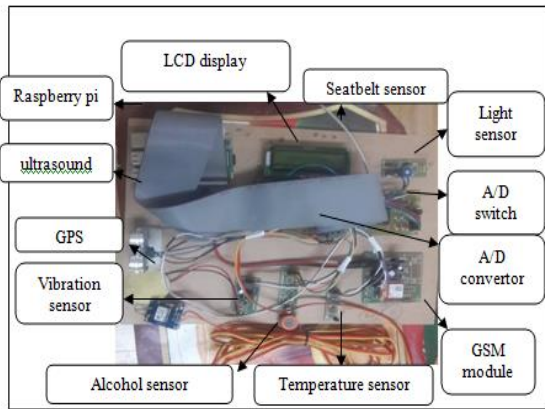

Figure3: Automobile Blackbox System.

V. RESULTS

DIFFERENT SENSORS VALUES SHOWN ON THE DESKTOP.

The different values are obtained by the sensors those are light sensors, temperature sensors, distance gauge sensor, seatbelt, on the desktop, The Alcohol sensor value is208 it indicates the person takes the alcohol. This sensor gives alcohol output that is connected ADC on the raspberry pi and the power supply voltage is 5V. The distance gauge sensor is used to find the obstacle in front of the car, here the obstacle distance is 38.62 it is not near the car if the obstacle is below the 10meters distance, then it displays the message on led and gives the buzzer sound. And the same way it gives the information that the driver wears a seatbelt at the time of the crash and the light sensor also gives the information that the lights in the car are functioning properly are not. The GPS gives the location of the car where the accident occurred and the GSM module acts as a bridge in between mobile and black box to communicate with each other.

Figure 4; the text message received to the users mobile number regarding to the accident location and over heat temperature.
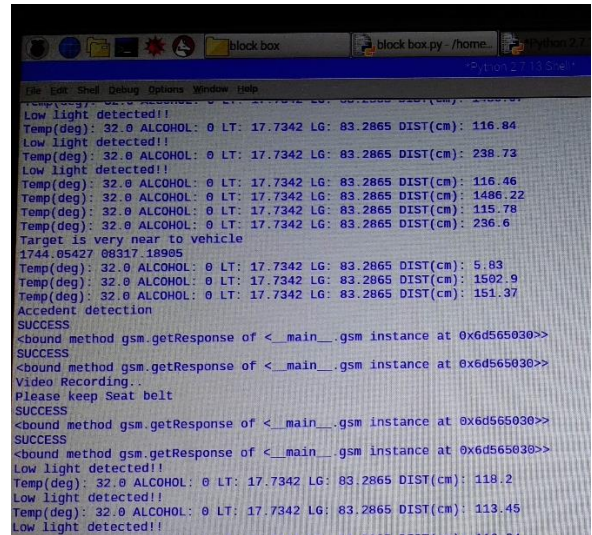

Figure 5: data log stored in Sd Card

It sends the message to the prefixed number, some emergency number like EMS (Emergency medical service) of the nearest hospitals to provide the first aid as early as possible.
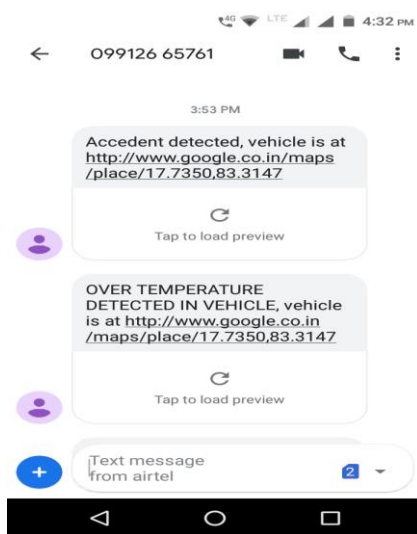

Ref: Google Maps
Figure 6: location of the accident received on user mobile

VI. CONCLUSION

In this paper, we are with basic prototype system which will be a great advantage for the automobile industry. It is very easy to operate this system which gives detailed information of the incident and also stores the footage of that. This prototype stores the required information of the incident and also sends the intimation of that incident to the given mobile number also longitudinal and latitudinal information to the user, last 10 minutes footage is captured and is replaced after every incident.

VII. FUTURE SCOPE

This system will further used for prevention of major accidents, for many insurance companies this system will help to identify how accidents happened using the real-time, future modifications we can use scanners for better working of this Prototype. It can be improved by including a face recognition algorithm focusing on the eye to continuous the monitor consciousness of the rider.

VIII. REFERENCES

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Mr. Akash Kumar Gupta pursued his Bachelor's degree in Electronics and Communication Engineering from Gokul Institute of Technology and Sciences in 2011 and Master's in VLSI & Embedded Systems from GMR Institute of Technology in 2013.He is presently working as Assistant Professor at Raghu Institute of Technology, Visakhapatnam, India. His areas of interest are VLSI, Embedded Systems Microstrip Antennas.

Ms. M. Navya is Pursuing Her Bachelor's of degree in Electronics and Communication Department, in, Raghu Institute of Technology, Visakhapatnam, and Andhra Pradesh, India.

Mr. A. Sekhar is Pursuing his Bachelor's degree in Electronics and Communication Department, in Raghu Institute of Technology, Visakhapatnam, , India.
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Mr. S.Suman Kumar is pursuing his Bachelor's degree in Electronics and Communication Department, in Raghu Institute of Technology, Visakhapatnam, India

Mr. M. Narendara Easwar Kumar is pursuing his Bachelor's degree in Electronics and Communication Department, in Raghu Institute of Technology, Visakhapatnam India.