Smart Black Box System For Vehicle Accident Monitoring

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Abstract- *In present days we can see that every single person may come across with accidents and this is one of the critical situations to face. Among those, few people can survive and few people may lose their lives and this occurs due to lack of information.The main cause of death was recorded due to the unavailability of medical services at the time of accident, and also the reason for the cause of accident is also not known. So to overcome these problems, a Smart Black Box system came into existence. Data received from the sensors are stored on the SD card mounted on Arduino UNO for investigation purpose after the accident. The system consists of Micro Electro Mechanical System (MEMS) accelerometer, Speed Sensor and Global System (GSM) module. Micro Electro Mechanical System (MEMS) is a high sensitive sensor and capable of detecting the tilts. In case of accident, Global System for Mobile (GSM) module will send short message to family member. Another important feature of our system is memory call back or crash recorder which records movement of vehicle before, during and after the crash. This data is also stored in IoT to prevent data tampering and the information aids the necessary authorities to act immediately and provide safe travel.*

Keywords- Arduino, GSM Module, MEMS Sensor, Speed Sensor, IoT, Accident Recovery.

I. INTRODUCTION

Advanced countries are currently implementing Black box technology in all automobiles as the safe and secure travel to the passengers. These car black boxes only records important information such as vehicle speed, temperature, location constantly. Existing black box is used to store video and audio information during a specific period before and after the accident using embedded devices. This information offers a means for accident analysis to a limited extent. Hence the proposed smart black box monitor's the driver's conditions continuously while driving and also stores the data about the condition of the vehicle. This cost effective Black Box is used in automobiles which serve the people to travel safely and avoid road accidents.

II. OBJECTIVE

The analysis of a car accident requires physical evidence, including clear evidence from the accident site, a witness, and a trace of the vehicles. In many cases, however, insufficient evidence is collected, and it is difficult to accurately identify the accident cause and the victims or offenders. Thus, even crimes using car accidents are happening. To solve these problems, objective accident data are required. To solve the above problem and to reduce the accidents to ensure the safety of public, the designed Smart Black box plays a major role. In addition to the basic function, the proposed Smart car black box is equipped with GSM/GPRS communication system which can send accident location information to care takers, emergency services and disaster server in real-time.

III. LITERATURE SURVEY

JadhavAditeeChandrashekhar,KulkarniPavitraVenkatesh, Kumar ArpitaBirendra, Prof. M. S.Kasar designed a BlackBox for Vehicles. It is designed with information needed for better accident analysis. Essentially it evaluates the cause of accidents and location of the accident. It records the data and provides an analysis and save the data in SD card Module.

KaziAaliya, GantyalaSupriya, PrabhutendolkarMrunal ,KadamSupriya , V.L.Salke designed a wireless black box using MEMS Accelerometer for Vehicle Accident Monitoring. An innovative wireless black box using MEMS accelerometer with GSM module is developed for vehicle accidental monitoring. After accident is detected, short alarm message will be send via GSM network. Black box is used to store different parameter of vehicle in memory card.

Tusharshelke, NilimaRaut, Swati Sayare ,ShitalBhade, ShitalManmode and RajashriSadawarti designed Accident Detection System using black box system.It is developed to record informational data, such as speed of car temperature of engine, etc. It can also use for vehicle mapping and accident alert with the help of GPS and GMS technology.Whenever the vehicle meet with an accident an

Alert Message will be sent to Home contact number including current GPS location of vehicle.

Sahil.S.Rangari, Sumedh.S.Moon, Saurabh.R.Funde, Subrato.P.Dixit and O.G.Hastakdesigned Implementation of blackbox in automobile system.The black box is officially called as slowly gains an important device in investigation of car accidents. We can easily retrieve the data from the Black Box. By recording the events and actions of the driver including speed, braking, turning, etc. seconds before the collision. The car black box will undoubtedly help both the police and insurance companies in reconstruction of the events before the accident.

B. Saritha, Dr.B.LokeswaraRao and K. Uday Kumar designed a smart black box in automobile system.The Black box system has a technology that it can store the information when an accident happens.MEMS, Vibration and Ultrasonic sensors are used in the black box.It can store the information that sensor values, surrounding images and speed of the vehicle. This can be useful at the time of investigation so, that the investigators can easily know about the accident.

IV. METHODOLOGY

The Smart Black box is designed using Arduino Atmega UNO 328P microcontroller. Temperature sensors monitors the temperature of the engine. A gas sensor is a device which detects the presence or concentration of gases in the atmosphere inside the car. GSM/GPRS module is a used to provide the approximate latitude and longitude of the vehicle. Buzzer performs a key role through its audio alert signals to the respective persons. MEMS Sensor is used to calculate the angular velocity of the Car, where the car is tilt near or roll over the side path of the car.
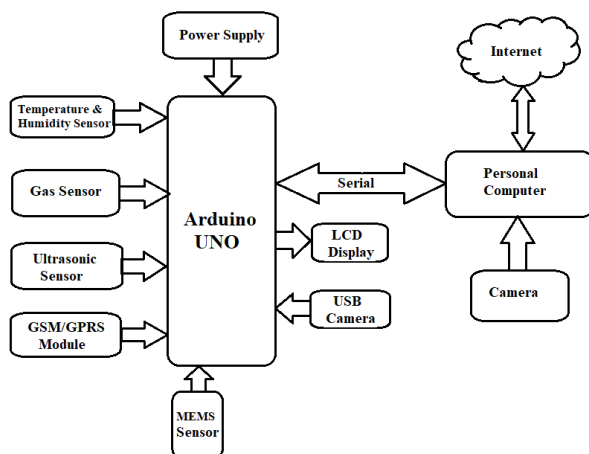

Fig.1.Block Diagram of the System

V. COMPONENTS

ArduinoAtmega 328P: The Arduino microcontroller is high performance low power microcontroller is based on AVR RISC Architecture. It is used in Arduino boards. It has rich resources, including Camera, USB, MEMS Sensor, GPS Modem, GSM/GPRS Module, Power, etc.

Ultrasonic Sensor: Ultrasonic sensoremit ultrasonic pulses, and by measuring the time of ultrasonic pulse reaches the object and back to the transducer. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer. After having emitted the sound waves, the ultrasonic sensor will switch to receive mode. The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor.

MEMS Sensor: MEMS stands for Micro Electro Mechanical Systems and ADXL335 sensor is used.It can measure the static acceleration due to gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

Temperature and Humidity Sensor: The DHT11 module is a precision integrated-circuit sensor.This sensor is pre-calibrated and don't require extra components so you can start measuring relative humidity and temperature

Gas/Smoke Sensor: MQ2 is one of the commonly used gas sensors in MQ sensor series. A gas sensor is a device which detects the presence orconcentrationof gases in the atmosphere. MQ2 Gas sensor works on 5V DC and draws around 800mW.It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide Concentrations anywhere from 200 to 10000ppm.

GSM/GPS Module: SIM900AT MODULE specification is used in this project. GSM/GPRS module is a wireless modem which is used to establish communication between mobile device and GSM/GPS system.

16X2 LCD Display: This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply.

Web Camera: A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment.When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

VI. ADVANTAGES

- The driver's behaviour monitoring constantly before and after the accident.
- Able to prevent the future accidents using data analysis.
- Useful for Police investigation and insurance company.

VII. APPLICATIONS

- Monitor your Driving :

    This can be a handy tool for learner and new drivers, highlighting the areas you need to work on in your driving.

- Evidence in an accident :

    Another surprising benefit of black boxes is that if you get into an accident, the black box can be used as evidence. It can prove you were driving at the correct speed limit or whose fault the accident was.

- Track your car :

    In the Unlikely event that you lose your car or it is stolen, you can use black box to locate the car.
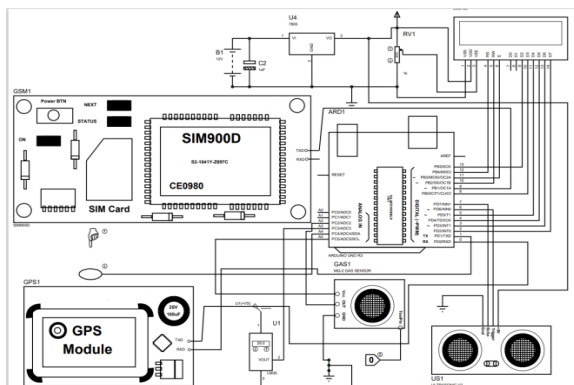
VIII. INTERNAL SCHEMATIC DIAGRAM

Fig 2 Schematic Diagram

IX. VERIFICATION AND RESULT

(A). Temperature& Speed Sensing

Temperature is an important thing in a vehicle engine. The engine should be operated in optimum temperature for better performance and fuel efficiency. Any damage to the cooling system can lead to abnormal temperature rise in engine this may lead to engine failure even to the extend to get fire

Fig.3 Real Time Value

(B). GPS & GSM Technology

GPS&GSM Technology Whenever an accident occur the black box will store the data last available before the crash with coordinates of location where the vehicle travels. It also sends an SMS to a predefined number that set in its memory that the alerting accident happened at the location. When collision occurs the microcontrollerdetect it from sensor and as pre-programmed it will sends an SMS alert to the predefined number with the location coordinates of crash site. With this system it is highly possible to find the precise location of crash with ease and thus enables emergency unit to respond and reach the site within short time.
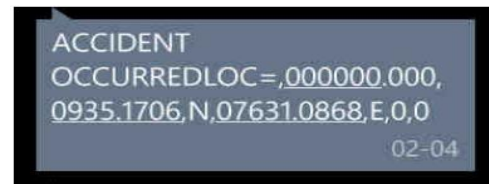

Fig.4 SMS Alert

Fig.5System Hardware

X. CONCLUSION

In the present scenario, the embedded system technology is developing rapidly and finds solutions for many real time problems. This paper is focused on developing an user friendly embedded system to predict the cause of accidents prior to its occurrence. The Smart Black Box system designed, which can be implemented in any vehicle and focus on solving driver privacy concerns and communication and management overheads. The Evidence Collection system from Black box thus developed will have a better performance and broader market prospect if it is converted to product.

XI. FUTURE SCOPE

In future, wireless network is connected to the rescue team or highway patrol communications network, notice of an accident can automatically delivered and follow-up measures can be taken, including life-saving or accident-handling measures. Faster reporting will increase the probability of successful rescue, and provide measures for preventing a traffic jam due to the accident. Getting all the information to ECU (Engine Control Unit) will help to store all the data related to vehicle's mechanical, electrical and electronics system to blackbox thus reducing the extra sensors and actuators needed for black box.

REFERENCES

[1] Manish Bhelande ,VirajChaudhari , Prathamesh Gore , Raj Dhure , AbhishekBhayye**"Car Black Box"** International Journal of Advanced Research in Computer and Communication Engineering Volume. 5 |Issue: 03 | March 2016.

[2] Yogesha K R and Mrs.Shwetha M K **"Design and Implementation of Car Black box for Evidence Collection System to Avoid the Collision"** International Journal for Modern Trends in Science and Technology Volume. 2 | Issue: 06 | June 2016.

[3] JadhavAditeeChandrashekhar, KulkarniPavitraVenkatesh, Kumar ArpitaBirendra, Prof. M. S. Kasar**"Black box for vehicles "**International Journal for Research in Engineering Application & Management (IJREAM) Volume.3 | Issue:01 | April 2017.

[4] KaziAaliya , GantyalaSupriya , PrabhutendolkarMrunal , KadamSupriya , V.L.Salke**"Wireless Black Box Using MEMS Accelerometer for Vehicle Accidental Monitoring "** International Journal of Innovative Research in Science, Engineering and Technology Volume. 6 | Issue: 04 | April 2017.

[5] Tusharshelke , NilimaRaut , Swati Sayare , ShitalBhade ,ShitalManmode ,RajashriSadawarti**"Accident Detection System using Black Box System "**International Journal of Engineering Science and Computing Volume.7 | Issue: 03 | March 2017.

[6] Sahil .S. Rangari, Sumedh .S. Moon2, Saurabh .R. Funde, Subrato .P. Dixit,O.G.Hastak**"Design & Implementation Of Black Box In Automobiles System"** International Research Journal of Engineering and Technology (IRJET) Volume.5 | Issue: 03 | March 2018.

[7] ShraddhaPawar, PoojaPawar, PoojaDhavale, L.M.Sagale**" Car black box with Collision detection system "**International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE) Volume.5 | Issue 4 | April 2018.

[8] B. Saritha ,Dr. B. LokeswaraRao , K. UdayKuma**" A Smart Black Box System Using Raspberry Pi "** International Journal Of Research In Electronics And Computer Engineering Volume. 6 | Issue: 03 | September 2018.

[9] M. Srinivas**" Advanced Wireless Box Using Mems For Vehicle Accidental Monitoring With Perfect Location "** International Journal Of Current Engineering And Scientific Research (IJCESR) Volume.5| Issue: 01 |September 2018.

[10] P. SwethaKeerthi, SK. AsmaParveen, P.A.S.SreeSowmya, R.Vyshnavi, Y.JyosthnaVenkat**"Accident Prediction and Crash Recovery by using Car Black Box "**International Journal of Innovative Technology and Exploring Engineering (IJITEE) Volume.9 | Issue: 06 | April 2020.