Car Black Box System

[1]Shreyash Shinde, [2]Shreya Choudhari, [3]Adesh Khaladkar, [4]Prof. Archana Randive

[1,2,3]Student, E&TC Engineering, AISSMS Institute of Information Technology, Pune, Maharashtra, India

[4]Assistant Professor, E&TC Engineering, AISSMS Institute of Information Technology, Pune, Maharashtra, India

Abstract - **Auto accidents claim lives for the general population in numerous countries. Rough driving by intoxicated drivers continues to be a problem. Black Box System Analysis is a viable solution for this problem. The services for vehicle data are changing. It is used to look into the causes of auto accidents and put an end to the property damage and casualties that arise from them. In many nations, car accidents are a serious public health hazard. The problem of drunk drivers and riders driving recklessly is still becoming worse. Black Box System Analysis is one tool that can be used to address this problem. Technology and autos are enabling vehicle data services to advance to new heights. Automatic black boxes work in a similar way as black boxes on airplanes. It is employed to investigate the reasons behind motor accidents and stop the property damage and casualties they create.**

Keywords: Car Black Box System, Auto accidents, Vehicle, vehicle, Car.

I. INTRODUCTION

The World Health Organization estimates that car accidents cause 20–50 million injuries and 1.35 million fatalities annually worldwide. Particularly, a certain percentage of fatalities and injuries are brought on by delayed medical attention and subsequent collisions as a result of the rescue organization and nearby vehicles not receiving prompt information about the incident. As a result, creating an effective accident detection system is crucial since it may drastically lower the amount of fatalities and injuries as well as the severity and impact of accidents.

Road construction and maintenance errors, traffic congestion, and an increase in the number of cars are only a few of the numerous causes of traffic accidents. In addition, the absence of common sense among drivers and other road users has made things much more difficult. It is tragic for our country that young people are primarily losing their lives on the roads due to careless driving, intoxicated driving, and other factors.

This project records skid angle, distance and gas to revolutionize the auto accident investigation industry. Using GPS and GSM technologies, it can also be utilized for vehicle mapping and accident warning. The first step toward tackling this problem, which transcends national borders and imperils people's health and safety everywhere, is the implementation of black box systems. As you are aware, there are several reasons why accidents happen at the current rate. It's critical to plan for insurance and claims as well as the aftermath of an accident. The policy is divided into several sections. The necessary documentation is needed to enforce any agreements. With the use of this system, you can get to the Black Box that helps your insurance company settle your claim. There will also be an accident tracking system in place. In the event of an accident, a warning message containing the vehicle's current GPS location will be sent to your home contact number. This approach helps prevent fatalities. Theoretically, a black box is a secure storage mechanism survives completely under all environmental conditions. Several vehicle parameters are stored by the black box using a memory card.

II. LITERATURE REVIEW

[1] The research article analyses the implementation of a vehicle black box system using an Internet of Things (IoT) based approach. The relevance of gathering and analysing information about accidents and vehicle performance is discussed in relation to the rising demand for vehicle black boxes. The authors suggest an IoT based strategy that uses sensors to gather information on the operation of the vehicle and send the information to a cloud-based server for archiving and analysis.

[2] In order to reduce the loss of life and property due to vehicle accidents, this research study suggests a prototype for an automobile black box system that may be fitted into cars. The system uses 12 sensors to track several aspects of driving behaviour, including the usage of external sensors like a camera and a Global Positioning System (GPS) to gather video and location information. For later retrieval in the event of an accident, the sensor data is stored on an SD card mounted on a Raspberry Pi controller. Data encryption is used by the system's security module to prot ect the data saved on the SD card. To get first assistance started as soon as possible, the suggested method uses GPS to transmit a brief message containing the location of the car to a family member, emergency services, and the closest hospital. The report also offers a summary of the system's major parts.

[3] In order to gather data for more accurate accident analysis, the Vehicle Black Box System (VBBS) prototype being developed for installation in any car worldwide is described in the study. The most crucial information required following an accident is listed together with a description of the hardware and software resources devoted to VBBS. The hardware component comprises of in-vehicle sensors and a black box that collects sensor status data and stores it in the EEPROM of the microcontroller. The study also describes the several kinds of sensors utilised in VBBS, such as switches, water sensors, and speed sensors. The system's software component, which presents the user with a streamlined version of the recorded data, is discussed. The relevance of a black box system in creating safer cars, treating collision victims better, and assisting insurance companies with their vehicle crash investigations is finally covered in the report.

[4] The article talks about how important it is to drive safely and introduces a new black box device that can be installed in any kind of car to record what happens in an accident. The concept of intelligent transportation systems (ITS) and safety applications that help prevent accidents or respond appropriately in the case of an accident are explained in the article. The article examines the deployment of safety applications in networks of vehicles with On Board Units (OBUs) and Road Site Units (RSUs). The taxonomy of safety apps is based on communication type, and they are split into two categories: event-based applications, which rely on event recording to gather data and transmit alerts, and communication-based applications, which need a specialised infrastructure made up of OBUs and RSUs. The essay also discusses fundamental safety principles and how VANETs depend on dedicated short-range frequencies (DSR) and the global positioning system because they are latency-sensitive (GPS). The usage of specialised infrastructure or intelligent vehicles is not necessary for the new black box system described in the article.

[5] The design and creation of a "Black Box for vehicles" that can be installed in any vehicle to track the origin, occurrence, a nd location of accidents are covered in the article. The system includes several sensors, such as RPM, steering touch, and accident sensors. It also has an audio/video recorder that starts recording as soon as the airbags deploy in the case of an accident. When an accident occurs, the system logs the parameters it was tracking at the moment, and it also uses GPS/GSM to send a message to the control centre containing the accident's location. According to the report, this method could enhance driver safety and avoid auto accidents, ultimately lowering the fatality rates from incidents involving transportation.

[6] A prototype black box for vehicles that may be fitted in any vehicle is discussed in the study paper. The black box technology can be crucial to car crash investigations, similar to flight data recorders in aircraft. The prototype offers comprehensive information about the vehicle, including a navigation system that works in tandem with Google Earth and artificial intelligence support through a channel of communication between the user and the vehicle. The report also covers the use of car-to-car communication to assess abruptness in the approaching vehicle prior to a collision. Also covered are the hardware and software resources needed for the black box system. Better crash research, collision data for research, limiting the speed of the car in accident-prone areas, and wireless communication through the transmission of an alert message in the event of a collision along with the time and location coordinates through GSM are all applications of the black box system.

[7] The development of an Arduino-based black box system for vehicles is covered in the article. In the case of an accident, the system is designed to identify incidents and send an alert message to a pre-coded number. The article also emphasises the need for technology to assist stop the loss of life and property due to the rise in traffic accidents around the world. The black box system logs many aspects of driving data and is linked to an opensource cloud. According to the article, the device is installed inside the car, which shortens the time it takes for emergency personnel to reach the scene of the accident. The technology employs a GPS module to locate the accident's position and sends that information to the pre-coded number via message.

[8] The development and application of a digital driving system for a semi-autonomous car that enhances the driver-vehicle interaction and incorporates black box features are discussed in the article. The system converts all control data from analogue to digital format using an ADC and displays it on an LCD using an Arduino-based data acquisition device. It incorporates GPS, GSM, and ESP01 for a variety of functions and utilises embedded networking through CAN for effective data transfer. The black box is physically mounted within the vehicle, connected to a GPS system, and equipped with a number of sensors that measure various data in order to pinpoint the root of any problems. The system also consists of MCP2515 modules for data transfer, and received data is passed by Arduino NANO to I2C LCD. A review of the literature is included in the methodology section of the paper and covers topics like programming an Arduino to accept messages from the CAN bus, simulating and testing an automotive CAN bus, and various hardware and software methods for collecting data from CAN buses. Keywords like "Black Box," "Passengers," "Incident Detection," "Data

Parameters," "Micro Controller," etc. are used to summarise the content.

[9] The article suggests a prototype for an Automotive Black Box System that may be fitted in cars to investigate the origin of auto accidents and lessen the loss of life and property. The E-Black Box, wireless black boxes using MEMS accelerometers, and GPS tracking systems are only a few of the works in the field that are reviewed in this study. The method promises to increase security by avoiding tampering with the Black Box data and sending an alert message via Short Message Service (SMS) to a pre-stored mobile number in the event of an accident. The significance of utilising Black Box technology to reduce traffic accidents and enhance public safety is emphasised in the article.

[10] This research study examines an improved black box for cars that can communicate with the driver and provide comprehensive information about the vehicle, including a navigation system that works with Google Earth and artificial intelligence help. In addition to outlining the value of black box technology in automobile crash investigations, this study also introduces a prototype that can be built with the fewest possible circuitry. Together with live analysis through tests, the prototype is also intended to allow car-to-car communication for assessing abruptness in the approaching vehicle before it wants to collision. The paper discusses the hardware and software resources employed by the black box system and its applications, such as better crash research, enhanced driver education programmes, safer road designs, and wireless communication by transmission of alert messages in the event of collisions along with the time and location coordinates through GSM.

[11] The article talks about a black box system for contemporary transportation vehicles that logs information on things like position, fuel level, speed, and engine parameters like temperature and pressure. The system uses measurement, identification, analysis, and reporting as its four data collecting and analysis layers. A pressure sensor, temperature sensor, tachogenerator, fuel tank, and GPS receiver are just a few of the sensors that the first layer uses to gather data. A microcontroller processes the gathered data, which is then entered into a database. Based on the data gathered in the database, the last layer offers feedback. In order to give analysis as feedback to the driver and/or other parties, the system intends to capture information on the technical state of the vehicle and how it was operated.

III. PROBLEM STATEMENT

The primary reason for this project's motivation is the high rate of drunk driving accidents in India. Frequently, the individuals responsible for the mishap flee, making it difficult to identify them. Additionally, unintentional death cases are rising daily and victims are not receiving prompt medical attention.

The Car Black Box System will be implemented using the CAN Protocol in order to solve this issue.

IV. METHODOLOGY

If an automobile is involved in an accident, the sensor will initiate its surveillance mode immediately.

The user will exit surveillance mode if he is not in a life-threatening situation and is capable of helping himself. The system will initially use a GPS gadget to determine the location of the car once it has entered assistance mode. A power supply, often known as a power supply unit, or PSU, is a source of electrical power that provides energy, either electrical or otherwise, to an output load or set of loads.

The GPS is a rapidly developing technology that offers location versatility for surveying and navigation. All throughout the world, the GPS continuously gives three-dimensional positioning, 24 hours a day. The GPS device can compute additional data, such as speed, bearing, track, trip distance, and distance to destination, once the user's position has been established.

An LCD display is among the most often used components connected to a micro controller. This project uses a 16x2 display. This translates to 16 characters by 2 lines each line. The methodology is divided into three parts. The first part is on the design structure, followed by hardware description and the finally on the programming design. All these three parts were assembled together and experiments were then performed.

V. SYSTEM DESIGN

The primary control unit for detecting or alerting when an accident happens is the ATmega328P microcontroller. It gathers information from sensor, GPS, and GSM modules and displays the results on a display or in a message.
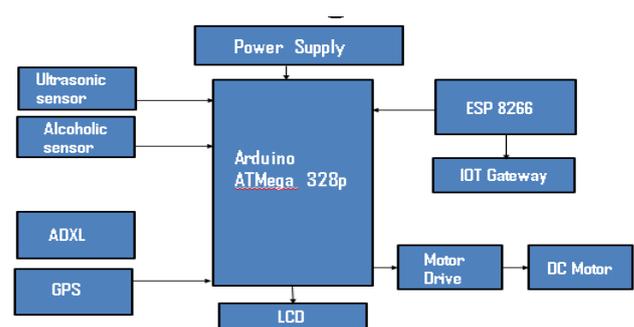

Figure 1: Block Diagram

With the adapter 12 volt attached to the microcontroller, the system is powered on.

In order to determine if the distance, we use the ultrasonic sensor.

To check the consumption of alcohol, MQ-3 Alcohol Sensor is used.

The car will stop and a buzzer will sound to inform the system if a sensor is detected. A relay will then receive the data and stop the motor attached to the vehicle.

Aside from the controller, the other two main components are the GPS module and the GSM reception module. In the event of an accident, the victim's location is tracked by the GPS. When a GPS module is utilized, GSM will SMS the user with the coordinates that were received. An LCD is employed to show coordinates or a status message. And the system will be alerted by a buzzer.

VI. RESULT AND DISCUSSIONS

This project introduces the Car Black Box System, an embedded system that uses the ATMEGA 328 microcontroller for design and implementation.

Experiments have been meticulously conducted. The outcome demonstrates that employing the embedded system does, in fact, result in improved efficiency.
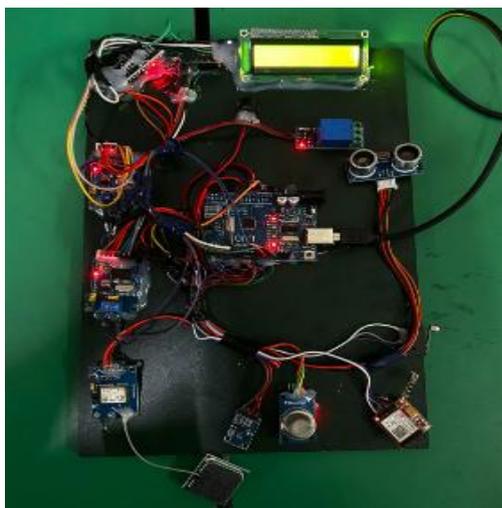

Figure 2: Hardware Setup

When an accident occurs, the GPS module uses satellite data to determine the exact location of the vehicle or object. This data is shown as a latitude and longitude scale. Consequently, the Arduino is subsequently supplied the gathered data. After the necessary processing is finished, the data is sent to the GSM modem and LCD.
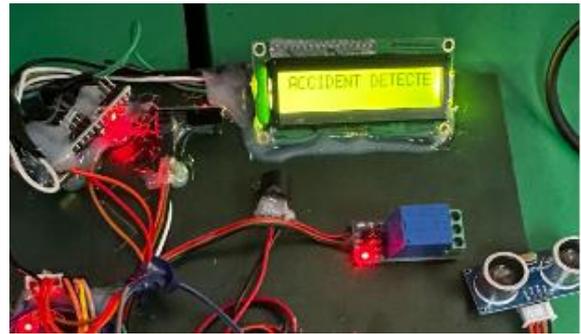

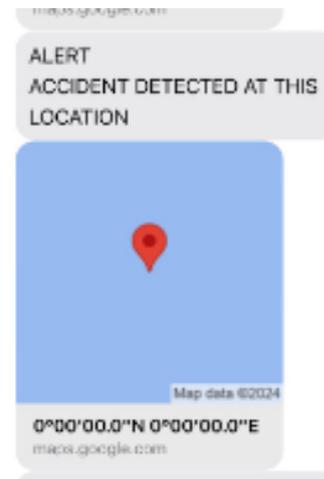**Figure 3: LCD displaying accident detected**

Figure 4: GSM Message

The information for the Arduino Uno is gathered by the GSM modem and then sent via text message (SMS) to the relevant mobile phone of the traffic police control room.

We monitor the properties of the sensor data for multiple simulated test cases or potential emergency situations. We took note of the sensor responses and divided the severity level into range values that represented low risk, minimal risk, and high danger. We will then alert the emergency responder or emergency contacts depending on these emergency scenario severity levels. The notification is also shown on LCD by the system.
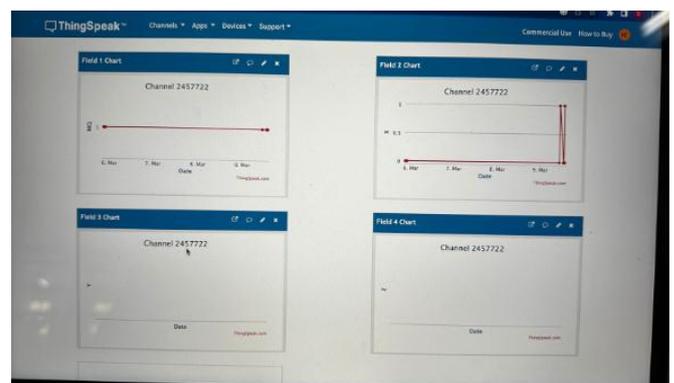

Figure 5: IOT graph generated

VII. CONCLUSION

The outcome demonstrates that employing the embedded system does, in fact, result in improved efficiency. This project is an intelligent, automated system that seldom ever interacts with humans. The suggested method addresses the detection and notification of accidents. These methods include smart phones, GPS, and GSM modules. In the event of an accident, contacting the closest ambulance using a GSM module significantly increases the victim's chances of survival.

The location can be transmitted using a tracking system to cover the area's geographic coordinates using GPS. By promptly recognizing accidents and initiating prompt assistance from emergency services, it may effectively address the majority of accident scenarios and minimize downtime. When a driver has a blood alcohol content above a certain level, the system will instantly identify their intoxication.

REFERENCES

[1] S. Sethuraman and S. Santhanalakshmi, "Implementing Vehicle Black Box System by IoT based approach," 2020 4th International Conference on Trends in Electronics and Informatics (ICOEI)(48184), Tirunelveli, India, 2020, pp. 390-395, doi: 10.1109/ICOEI48184.2020.9142906.

[2] M. J. Prasad, S. Arundathi, N. Anil, Harshikha and B. S. Kariyappa, "Automobile black box system for accident analysis," 2014 International Conference on Advances in Electronics Computers and Communications, Bangalore, India, 2014, pp. 1-5, doi: 10.1109/ICAECC.2014.7002430.

[3] A.Kassem, R. Jabr, G. Salamouni and Z. K. Maalouf, "Vehicle Black Box System," 2008 2nd Annual IEEE Systems Conference, Montreal, QC, Canada, 2008, pp. 1-6, doi: 10.1109/SYSTEMS.2008.4519050.

[4] E. jaidane, M. Hamdi, T. Aguili and T. -h. Kim, "An infrastructurless vehicle blackbox system," 2018 International Conference on Internet of Things, Embedded Systems and Communications (IINTEC), Hamammet, Tunisia, 2018, pp. 1-5, doi: 10.1109/IINTEC.2018.8695279.

[5] Car Black Box Manish Bhelande, Viraj Chaudhari, Prathamesh Gore, Raj Dhure, Abhishek Bhayye Asst. Professor, Dept. of Information Technology, Shah and Anchor Kutchhi Engineering College, Chembur, India1, Student, Department of Information Technology, International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2016.

[6] A RESEARCH PAPER ON UPGRADED BLACK BOX FOR AUTOMOBILES Sharvin Pingulkar1, Haroondeep Singh Sandhu2, Jayant. R. Mahajan3 1BE Student, Electronics and Telecommunication Engineering Rajiv Gandhi Institute of Technology, Mumbai 2,3Professor, Electronics and Telecommunication Engineering ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, VOLUME-3, ISSUE-2, 2016 INTERNATIONAL JOURNAL OF CURRENT ENGINEERING AND SCIENTIFIC RESEARCH (IJCESR).

[7] "Vehicles Black Box System Using Arduino ", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN: 2349-5162, Vol.8, Issue 2, page no. 1498-1501, February-2021, Available :http://www.jetir.org/papers/JETIR2102178.pdf

[8] Vehicle Black Box Based on Can and IOT Protocol 2 Jayesh Rathod, Sanjana Thakur, Shital Waghotkar , Mala Yadav, Prof. Priyanka Sharma, IJRASET42362, Pub. IJRASET.

[9] Automobile Black Box System for Accident and Crime Analysis Narendra Tallapaneni, Gudapati Krishna Hemanth, K. Venkatesh International Journal of Scientific Research & Engineering Trends Volume 7, Issue 4, July-Aug-2021, ISSN (Online): 2395-566X.

[10] A RESEARCH PAPER ON UPGRADED BLACK BOX FOR AUTOMOBILES Sharvin Pingulkar1, Haroondeep Singh Sandhu2, Jayant. R. Mahajan3 1BE Student, Electronics and Telecommunication Engineering Rajiv Gandhi Institute of Technology, Mumbai, ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, VOLUME-3, ISSUE-2, 2016.

[11] Rajendra Balsara, Rushikesh Gadhave, Aditya Kanojia, Charansingh Patil, 2015, Black box for Transport Vehicles, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) ICONECT – 2015 (Volume 3 – Issue 06).

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