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Wireless Blackbox and Safety Application for Car

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ABSTRACT
The main goal of the article is to develop a working prototype of a Wireless Blackbox for Cars that can be put in any vehicle and record and display different crash-related or erratic behaviour data, including temperature, location, vibration, and blood alcohol level. The system will notify registered cellphones about an accident and include emergency contact information for police, hospitals, family members, and car owners. Additionally, the system has an RFID transmitter and receiver. The adoption of this technology is anticipated to reduce fatalities, increase auto safety, improve treatment for accident victims, support insurance companies' investigations, and improve road conditions.

Keyword: Arduino UNO, GSM, RFID Transmitter, RFID Receiver, Sensor, LCD Display, Voice Kit

I. INTRODUCTION

There are more cars on the roads and highways in the modern world as the population increases daily. Concerns have been expressed all over the world due to the annual loss of more than a million lives from accidents involving transportation. Consequently, a practical solution to this problem is required. One such option has been identified as the black box system, which is similar to the flight data recorders used in aeroplanes. This technology can be very helpful in the investigation of motor vehicle accidents by detecting, gathering, and displaying information from the car in an understandable manner. The black box system is made up of two main sections: the first section makes use of various parts and sensors, and the second section uses the Embedded C programming language to retrieve and show data on an LCD screen. The system also includes an RFID transmitter and receiver that alerts drivers of hazardous areas. Extensive research has been conducted to determine which sensors are necessary in the vehicle to make this system efficient, with engine temperature, vibration caused by speeding, lane detection, and CAN failures being among the most important data required following an accident. This research paper aims to provide a detailed analysis of the black box system and explore its applications, advantages, and limitations in investigating transportation-related accidents."

II. LITERATURE REVIEW

A. Existing Method

The phrase "BlackBox" was first used in the aviation sector to describe a flight recorder; it is now more frequently used to refer to such devices as "orange boxes" to make them easier to find. This electronic gadget is mounted on an aircraft with the intention of helping with accident and incident investigations in the aviation industry.

A system that is currently in place is a device for recording auto accidents. Abnormal activity and issues with the engine were detected electronically. Due to the fact that the current system is primarily intended to monitor airbag activation, it does not follow the movement of the car or the driver's actions, but it does collect numerous types of crucial data only a few seconds before the accident.

B. Research on few Affiliated Paper

Sl. no	Paper title	Method	Advantages	Limitation
1	Surveillance and Black Box for Car		Potential to improve road safety by providing valuable data for accident investigations and enabling real-time monitoring of driver behavior.	Concerns about privacy violations and the cost of implementing the system in all cars.
2	Wireless Black Box System for Vehicles	experimental testing and simulation to investigate the impact of varying parameters on the performance of a solar still for water desalination.	Potential to provide a low-cost and sustainable method for producing fresh water in areas where access to clean water is limited.	Efficiency of the solar still may be affected by external factors such as weather conditions, which could impact the overall effectiveness of the system.
3	Wireless Black Box using MEMS Accelerometer and GPS Tracking for Accidental Monitoring of Vehicle	developing a wireless black box system that uses MEMS accelerometer and GPS tracking to monitor vehicles for accidents and collect data for accident reconstruction.	it can improve road safety by providing real-time accident detection and valuable data for accident investigations.	it relies on the availability of GPS signals, which may not be reliable in certain areas or under certain conditions, potentially affecting the accuracy of the system.
4	Black box for vehicles	black box system for vehicles that uses sensors to collect data on vehicle performance and driver behavior, with the aim of improving road safety and providing valuable information for accident investigations.	it can help identify the causes of accidents and improve road safety by providing valuable data on vehicle performance and driver behavior.	the use of such a system may raise privacy concerns as it involves recording and storing data on driver behavior and vehicle performance.

5	Wireless Blackbox for cars using sensors and GPS module	developing a wireless black box system for cars that uses Sensors and a GPS module to monitor vehicle speed, location, and other parameters to improve road safety and provide valuable data for accident investigations.	it can improve road safety by providing real-time Monitoring of vehicle behavior and identifying potential safety hazards, as well as valuable data for accident investigations.	it may raise privacy concerns as it involves Collecting and storing data on the behavior of drivers and their vehicles.
6	Wireless blackbox for tracking of accidental monitoring in vehicle	Developing a smart vehicle black box system that utilizes sensors and GPS technology to monitor and analyze vehicle performance, as well as driver behavior and driving conditions, This aims to improve traffic safety and reduce the number of collisions. .	By offering constant tracking of vehicle activity, it has the potential to enhance road safety and identifying potential safety hazards, as well as valuable data for accident investigations.	it may raise privacy concerns as it involves collecting and storing data on the behavior of drivers and their vehicles.

Table 1.

III. PROPOSED METHOD

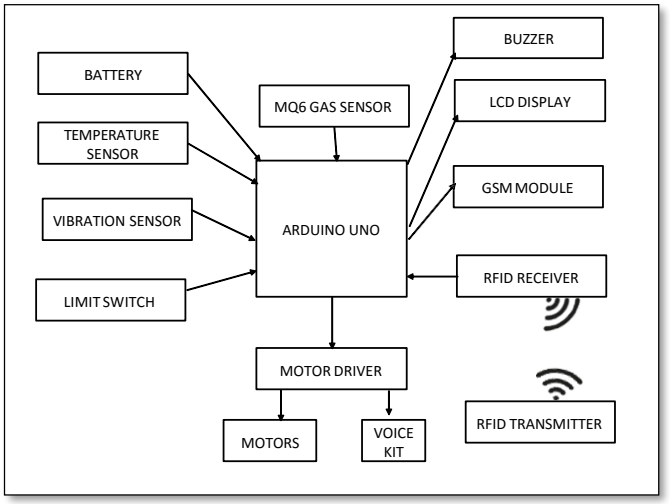
In this project, many sensors like temperature, gas, vibration, limit switch, and gas sensors are employed. A message will be sent to the registered cellphone phones, including emergency numbers for police stations, hospitals, and family members, when sensors detect data and if changes occur in the vehicle, the sensors display in an LCD. When an accident occurs or if any irregular behaviour is detected, the message will also be sent to the registered cellphones. The RFID reader is located inside the automobile, while the RFID transmitter is situated close to risky intersections, accident hotspots, and mountainous areas. The speech kit and buzzer installed in the car alert the driver when the vehicle passes through these regions within 500 metres.

IV. OBJECTIVE

The objective of the wireless black box and safety applications for cars is to develop a system that can monitor and record data related to vehicle performance, driver behavior, and driving conditions, which can be used to improve road safety, investigate accidents, and identify potential safety hazards

The following are the key goals of our suggested system:-

V. BLOCK DIAGRAM



VI. METHODOLOGY

The model comprises of a blackbox in which all the sensors and switches are controlled by an Arduino that is programmed using the Arduino IDE. It also includes a motor driver and two motors that allow the automobile to be moved using Bluetooth application installed in smartphone.

1. Initialization

The automobile has a switch to start it, and once it begins, an alcohol sensor installed at the steering checks the person's alcohol content. If it is above a certain level, the car won't drive ahead.

2. Driving mode

The driver receives notification from an LCD display and a buzzer installed in the blackbox whenever any unusual activity, such as engine heating or shaking in a car due to overload, occurs while driving.

The limit switches detect and send data to the Arduino whenever the automobile collides with something or hits something. The Arduino and GSM then send a message and the position to the registered cellphones, along with emergency numbers for police stations, hospitals, and family members.

The RFID transmitter is placed close to dangerous intersections, accident hotspots, and mountainous regions, while the RFID receiver is placed inside the blackbox and is controlled by an Arduino. When the vehicle travels through specified areas within 500metres, the voice kit and buzzer installed in the car inform the driver, allowing them to become aware and drive gently and cautiously to avoid an accident.

VII. EXPERIMENTAL DETAILS

A. Primary Inputs

1. *Temperature Sensor:* Rated to operate over a −55°C to150°C temperature range of an engine.

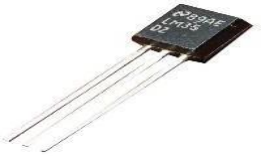


Fig. 1

2. *Vibration sensor:* Measures how much and how often a system, machine, or piece of equipment vibrates.

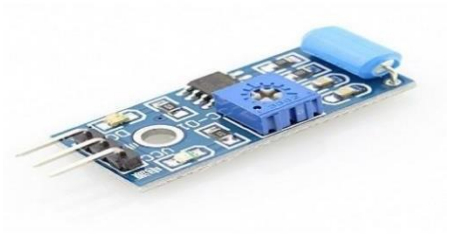


Fig. 2

3. *Alcohol Sensor:* Detects the alcohol content in the car and send the data to the arduino.

Fig. 3

4. *Limit Switch:* Detect and send data to the Arduino whenever the automobile collides with something or hits something.

Fig. 4

5. *Arduino UNO R3:* A microcontroller board called Arduino Uno is based on the ATmega 328. It has an ICSP header, a power jack, six analogue pins, a reset button, a 16 b MHZ crystal oscillator, and 14 digital I/O pins.* A number of microprocessors and controllers are used in the designs of Arduino boards. This board functions as the brain for all sensors. All of the sensor data is gathered and sent to the micro SD card storage module.

Fig. 5

6. *Motor Driver: serves as a bridge between the control circuits and the motors.*

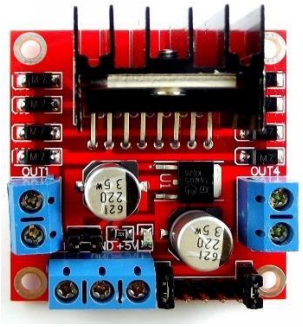


Fig. 6

7. *RFID Card: Radio-frequency identification is referred to as RFID. Applications requiring access control or the need to track or identify personnel often make use of RFID cards.*

Fig. 7

B. Primary Outputs

1. *GSM Module:* GSM/GPRS module is used to establish communication between a emergency service and a GSM-GPRS system.

Fig. 8

2. *RFID Card Reader Module: A 13.56MHz electromagnetic field is generated by the RC522 RFID reader module in order to interface with RFID tags . With a maximum data rate of 10 Mbps, the reader may interface with a microcontroller using a 4-pin SPI connector.*

Fig. 9

3. Bo Motor: An electric motor that uses a rechargeable battery for power is known as a BO motor. Due to the simplicity of cordless operation, these are frequently utilised in automobiles and portable gadgets.

Fig. 10

VIII. FUTURE ENHANCEMENT

Applications for wireless blackboxes and car safety, including those for cats, are continually improving. there are a few ways that these technologies might be improved in the future:

1. With the introduction of 5G, wireless networks are becoming quicker and more dependable. This enables more accurate and responsive safety applications since data can be delivered and analysed more quickly.

2. As artificial intelligence and machine learning develop, more intelligent and autonomous safety systems may result. Accordingly, based on prior incidences, wireless blackbox and safety apps may be able to anticipate and prevent mishaps before they occur.

3. Combining information from many sensors may enhance the precision of wireless blackbox and safety applications. This might make it possible for safer collision avoidance systems and more accurate danger detection.

4. In the future, it's likely that automobiles may be able to connect with the infrastructure along the sides of the road, which could increase efficiency and safety.

Finally, applications for wireless blackboxes and safety could benefit from augmented reality and virtual reality. For instance, to give drivers more logical feedback, visual alerts and warnings might be projected directly onto their windscreen.

IX. CONCLUSION

The creation of a black box system for monitoring and warning of auto accident behavior is the only goal of this project. By using alert messages, the system has successfully overcome the shortcomings of the old system. Finally, we draw the conclusion that an intelligent solution to the issue has been established employing a wireless black box system using sensors, GSM, and GPS tracking. In the future, we will be able to determine how close a vehicle is to our automobiles by utilizing ultrasonic sensor features. The car airbag system can be interfaced with this system to stop people from slamming into interior elements like the steering wheel or windows.

ACKNOWLEDGMENT

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