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THE VEHICLE BLACKBOX USING IOT

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ABSTRACT

The escalating number of daily fatalities resulting from road accidents in India is a pressing issue, primarily driven by factors like speeding, drunk driving, distractions, red light violations, and negligence of safety measures. To address this concern, our project focuses on developing a do-it-yourself (DIY) black box with accident prevention and alcohol detection features. This black box, traditionally used to record vehicle and occupant data during and after crashes, will be enhanced with Internet of Things (IoT) technology and various sensors to promptly alert vehicle owners of potential accidents or hazardous conditions. By deploying advanced sensors, the system aims to detect signs such as erratic driving behavior and collision scenarios, contributing to a significant reduction in accidents. Additionally, the integration of alcohol detection technology enhances safety measures by identifying instances of drunk driving and notifying both the driver and vehicle owner in real-time. This innovative approach aligns with the broader goal of creating a safer road environment in India, ultimately curbing the rising toll of road accidents.

Keywords: Embedded C, GPS, Arduino.

I. INTRODUCTION

The Concept Orientation IoT represents an emerging communication technology where devices are interconnected to the internet through various wireless communication protocols, facilitating machine-to-machine communication. These devices operate in real-time environments such as home automation and smart grids, contributing to the substantial growth and advancement of IoT technology. Despite numerous campaigns, the global issue of accidents, resulting in millions of daily deaths, persists. To address this, a solution is being proposed utilizing the concept of a black box for vehicles. This article advocates for the improvement of automation using IoT, presenting visual data monitored by the cloud through a low-power microcontroller. Two fundamental rules are maintained: sensor-detected data visualization and a straightforward method for presenting data to end-users. The automotive industry is pivotal in integrating high-range, low-power technology into vehicles. The vehicle black box constantly updates data recording, position tracking, and collision data during active mode, aiding in the swift identification of crash collisions and enabling prompt assistance to victims from governmental or hospital entities.

- In India, as reported by the Indian Express, the year 2016 witnessed a staggering 4,80,652 recorded accidents, resulting in 1,50,785 deaths.
- This data highlights an alarming daily average of 413 fatalities in 1,317 traffic accidents.
- Further analysis reveals a breakdown, indicating that, on average, Seventeen fatalities occurred in traffic accidents. every hour during that period in 55 accidents. These statistics are derived from an analysis of accidents that transpired in the year 2021.

II. LITERATURE SURVEY

According to N. Watthanawisuth, T. Lomas, and A. Tuantranont [4]This system comprises cooperative components, includingan accelerometer, microcontroller unit (MCU), device, and module designed for short message transmission. The accelerometer serves the dual purpose of providing awareness and detecting falls, signaling potential accidents. Real-time decision-making on falls or accidents is achieved through the motorcycle's speed and a threshold algorithm. Upon accident detection it transmitted. The module, designed in a robust package, ensures resistance to water spray and dust, making it suitable for diverse environments. The intended installation location for the module is under the motorcycle seat. Utilizing a high-performance 16-bit MCU, the system processes and stores real-time signals from the accelerometer, functioning akin to an airplane's black box. This stored accident history can be accessed by law enforcement and insurance examiners for thorough accident investigations.

In this study, Monisha Prasad, Nayana Anil, Arundathi[2] The acceleration of the vehicle at the time of the crash is measured using an accelerometer (ADXL335). It is a 3-axis MEMS accelerometer measuring static and dynamic acceleration. The important lights in a vehicle are the flashers, the brake lights, the headlights, and the rear lights. Light-dependent resistors (LDRs) are used to detect whether these lights were functioning properly during the crash. A wheel speed module is used to determine the rpm of the vehicle and, hence, the vehicle speed at the time of the crash. It consists of Reed switches and magnets. The magnets are attached to the rear wheels of the vehicle. The engine temperature of the vehicle is measured using a temperature sensor (DS18B20). A push button is used to examine whether the driver wore the seat belt at the time of the crash. Various warnings are given to the driver using a range of sensors. An alcohol sensor module consisting of an MQ3 gas sensor is used to warn the driver when he or she is high on alcohol.

An ultrasonic distance measuring module (HC-SR04) is used for the distance gauge.

III. COMPONENT SPECIFICATION

3.1 ARDUINO UNO:

The central processing unit for real-time control and data collecting is the Arduino Uno. The Arduino Uno is equipped with sensors, including GPS modules and accelerometers, which allow it to record vital data regarding the position and dynamics of the vehicle. It uses preprogrammed algorithms to examine this data and looks for irregularities that could be signs of an accident. Then, through its interface with IoT modules, the Arduino Uno makes it possible to send relevant data—such as crash details and position information—to the cloud for further processing and analysis. It is an effective and crucial part of improving the entire functioning and performance of the vehicle's black box system because of its adaptable and small design.

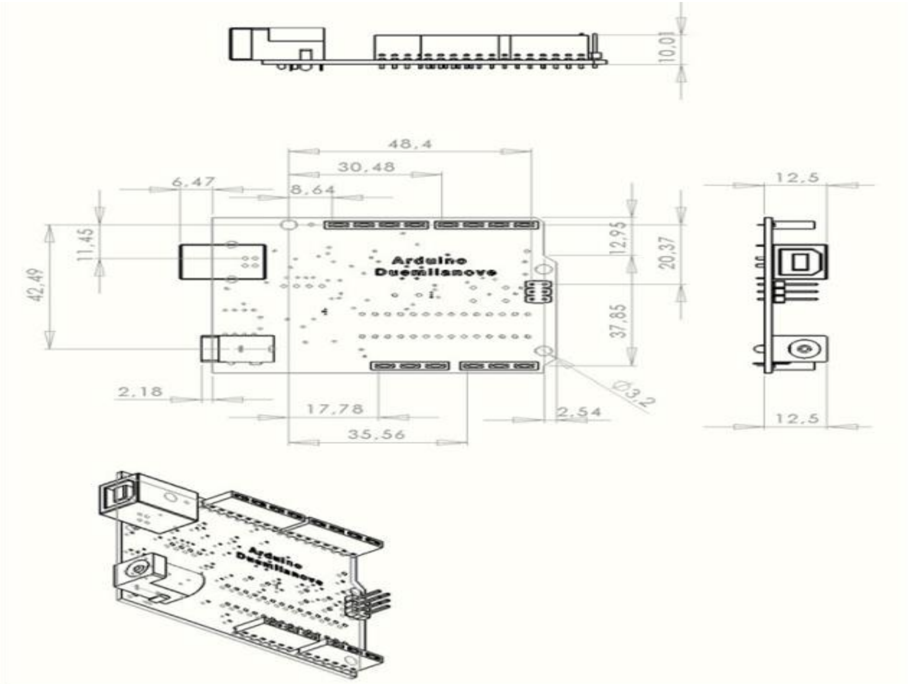

Fig 1: Arduino Uno

3.2 TEMPERATURE SENSOR:

The temperature sensor keeps track of the outside temperature of the car. It picks up on harsh circumstances that can affect performance or jeopardize electrical parts. It is integrated with the IOT system and sends temperature data in real time to the cloud for in-depth analysis. This functionality makes Preemptive maintenance possible by improving performance monitoring and overall safety. The sensor provides the black box with an essential layer of environmental data.

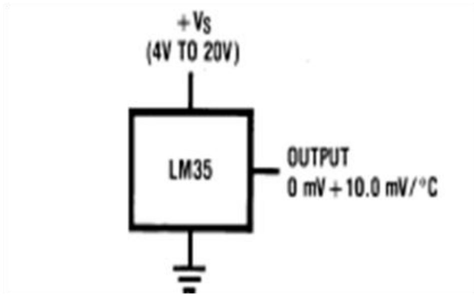

Fig 2: Temperature Sensor

3.3 GAS SENSOR:

The purpose of the gas sensor is to identify dangerous chemicals, like carbon monoxide and volatile organic compounds, in the car's surroundings. The sensor warns of possible hazards to passengers when it detects elevated gas levels by sending out a warning via the IoT system. This feature, which is integrated with the black box, improves safety precautions by offering real-time air quality monitoring within the car. Data from the gas sensor is sending to the cloud, allowing for remote analysis and prompt action to reduce health risks. This crucial component gives the entire black box system an extra layer of environmental monitoring.

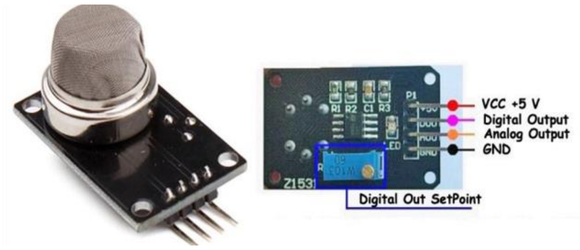

Fig 3: Gas sensor

3.4 ULTRASONIC SENSOR:

The ultrasonic sensor in the Vehicle Black Box IoT project functions by emitting ultrasonic waves to measure distances and detect obstacles around the vehicle. Integrated strategically, it enhances collision detection capabilities, providing real-time data on proximity to objects. When an obstacle is detected, the sensor triggers alerts through the IoT system, contributing to accident prevention. This feature is crucial for parking assistance and avoiding potential collisions, reinforcing the overall safety aspect of the black box. The ultrasonic sensor's data is transfered to the cloud, enabling comprehensive analysis and further enhancing the project's functionality.

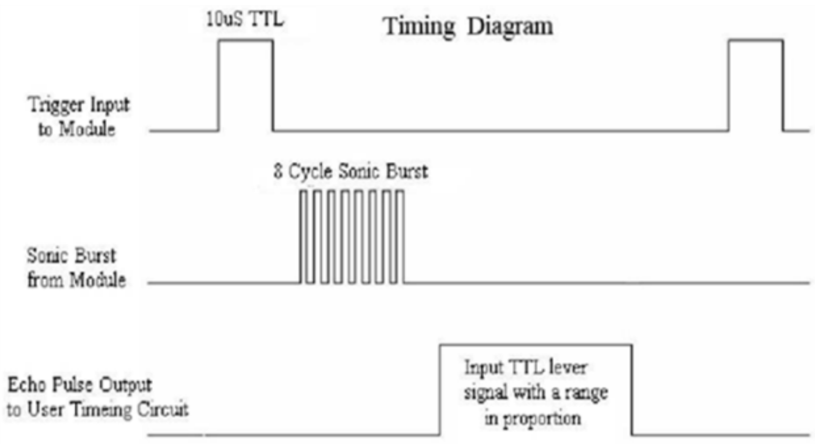

Fig 4: Ultrasonic sensor

3.5 ADC:

Analog signals, including those from sensors that measure acceleration or speed, are converted into digital data by the ADC. For precise and accurate monitoring of the vehicle's dynamic properties, this digital data is essential. The ADC, which is integrated into the black box, makes sure that analog signals are successfully processed and sent to the Internet of Things platform. This improves the system's capacity to gather and process real-time data, which adds to a wealth of information on the execution of the car. To process and transmit data efficiently, analog information must be converted into a digital representation, which is where the ADC comes in.

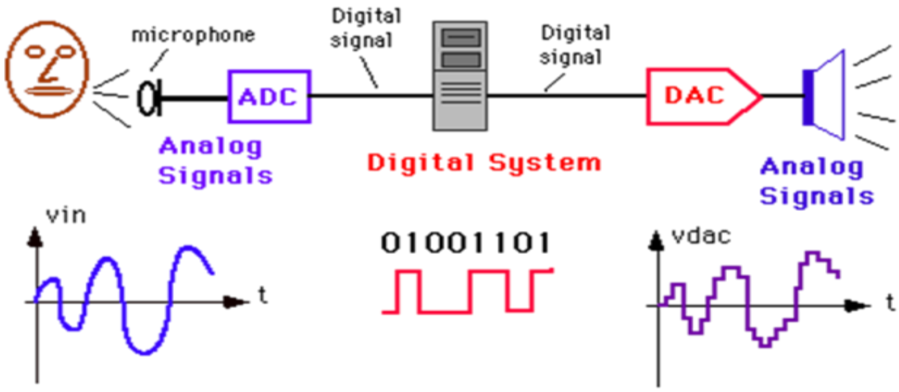

Fig 5: ADC

3.6 ACCIDENT SWITCH:

One essential safety component is the Accident Switch. It functions as a trigger mechanism, coming into action in the event of an accident or collision. Strategically integrated, the switch triggers the black box to capture and send real-time data to the IoT platform, including crash dynamics and position. This feature guarantees timely incident reporting for further investigation by law enforcement or insurance companies. The Accident Switch gives the black box an essential layer that improves its ability to record and report important events during auto accidents precisely.

3.7 BUZZER:

The Buzzer functions as a system of audio alerts. When the black box detects crucial events, such as accidents or unusual vehicle conditions, it is configured to activate. The buzzer, which is integrated into the system, gives the driver and passengers an instant audible warning. This improves situational awareness in real time and enables fast emergency response. The buzzer plays a vital part in keeping passengers informed about possible dangers and enhancing overall safety precautions in the car.

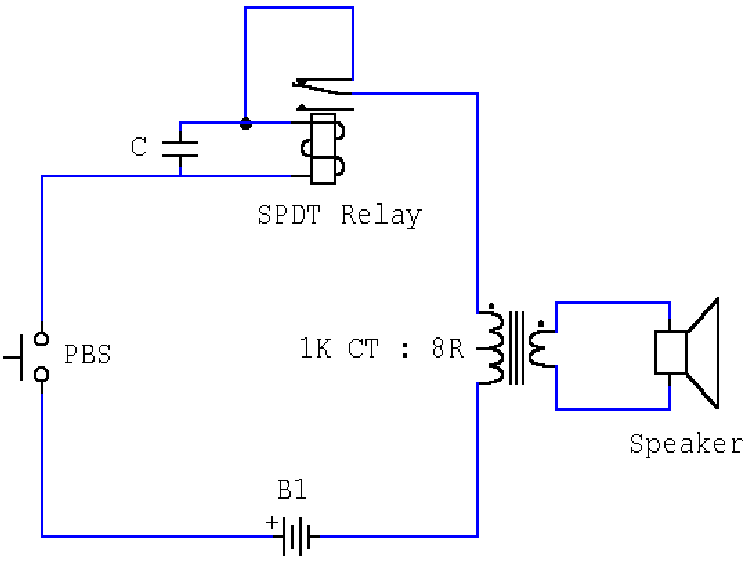

Fig 6: Buzzer circuit

3.8 GPS:

GPS technology is essential for tracking real-time locations and recording accidents. The GPS module is integrated within the black box and continuously records the exact coordinates of the vehicle. In the event of an

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accident, the IoT platform transmits the GPS data to the cloud, giving authorities precise information about the crash site. This feature facilitates thorough accident analysis and quick emergency reaction. The GPS makes the black box more effective overall by enabling location based insights for safety and investigative uses.

3.8.1 2-D TRILATERATION:

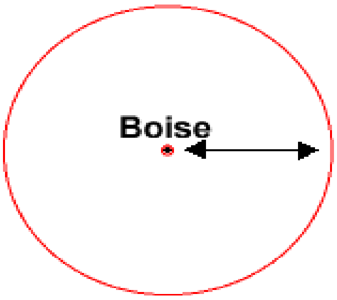

Fig 7:

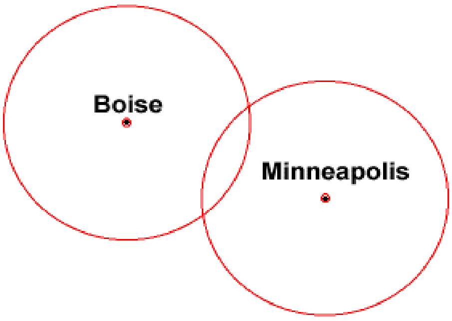

Fig 8:

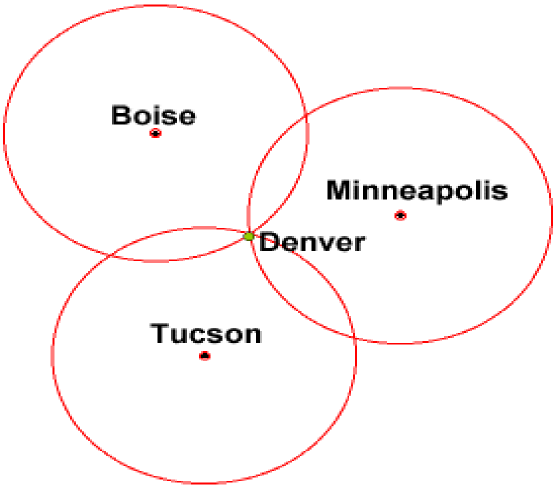

Fig 9:

3.9 MOTOR DRIVER:

Controlling the movement of motors, such as those attached to safety features or vehicle components, is the responsibility of the motor driver. The motor driver is an integrated system that reads signals from the black box and controls the motors accordingly. It might activate safety features or control systems of the accident. This feature adds to the overall safety measures in the car by improving the black box's capacity to react to important occurrences. The motor driver plays in guaranteing accurate and regulated actions based on the analysis and instructions from the black box.

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MOTOR	Permanent Magnet DC Gear Motor BO(Battery Operated)
LOCKED-ROTOR CURRENT	>=0.15A
SPEED(RPM)	60RPM+-10%(no load)
TORQUE	0.5Kg-cm

IV. BLOCK DIAGRAM

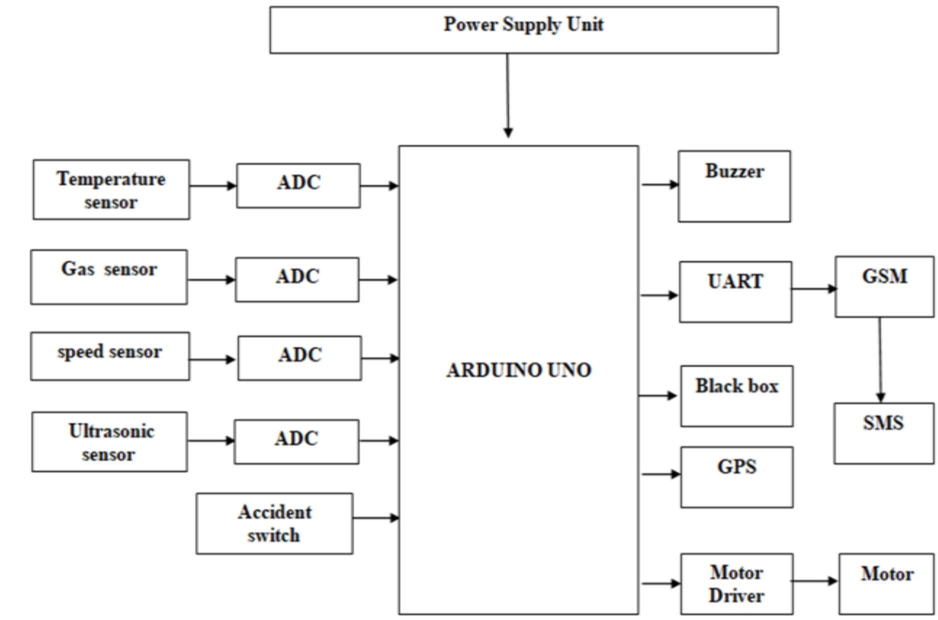

Fig 10: Block diagram

V. SOFTWARE OVERVIEW

EMBEDDED C:

Embedded C serves as the programming language for the microcontroller unit (MCU). It makes it easier to put algorithms and control logic into practice that are needed for processing data from multiple sensors in real-time. The black box can react quickly to important events like accidents because the MCU uses Embedded C to read signals from sensors like accelerometers and GPS modules. By maximizing the MCU's efficiency, this language guarantees a smooth integration for data transfer and analysis with the IoT platform. Embedded C plays implementing the features that lead to improved responsiveness and performance of the car black box system.

VI. EXPERIMENTAL ANALYSIS

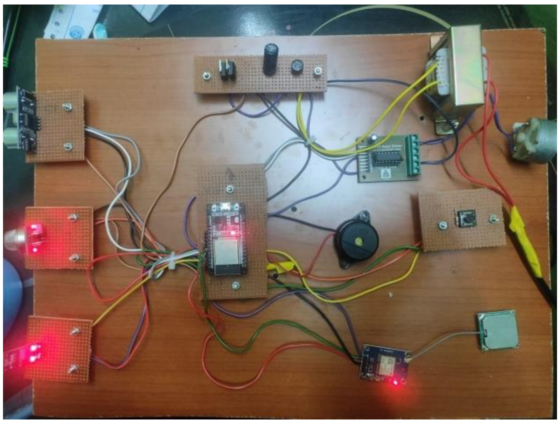

Fig 11: Hardware

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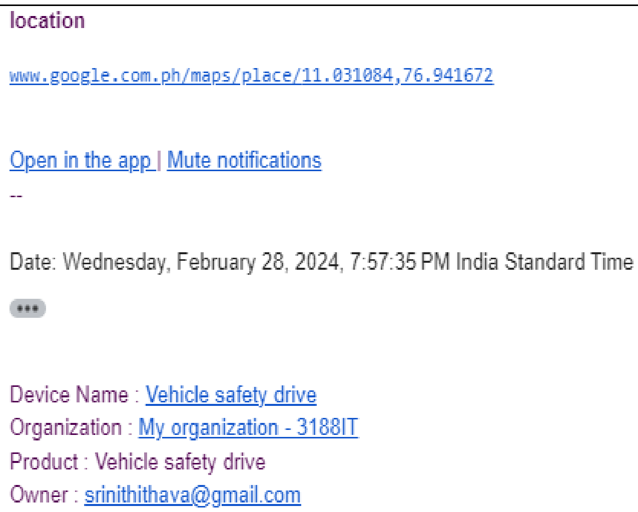
location

www.google.com.ph/maps/place/11.031084,76.941672

Open in the app | Mute notifications

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Date: Wednesday, February 28, 2024, 7:57:35 PM India Standard Time

Device Name : Vehicle safety drive
Organization : My organization - 3188IT
Product : Vehicle safety drive
Owner : srinithithava@gmail.com

Fig 12: Email Notification

Fig 13: Temperature Alert

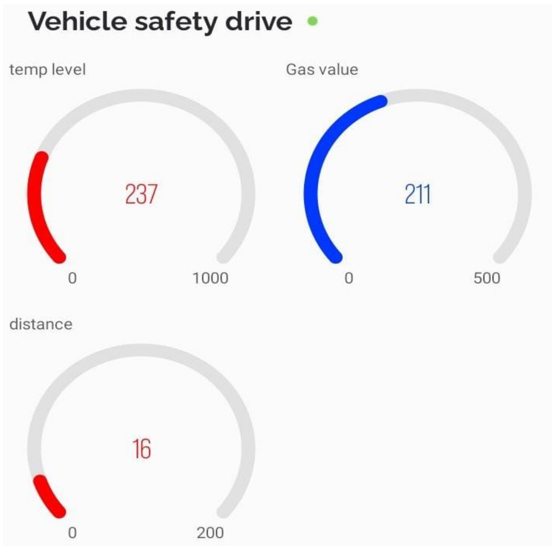

Fig 14: Frequency Level

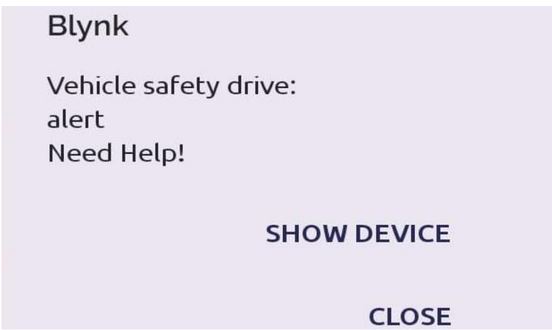

Fig 15: Emergency Alert

VII. CONCLUSION

An efficient smart vehicle system has been proposed that gives good security to driving. We have done a detailed survey of the existing systems for vehicles. Based on our analysis, we are proposing a smart vehicle method. The advantages of this system over other methods include the prevention of accidental injuries, improving the safety of driving to discourage careless driving, and helping to control traffic violations through an adaptable, simple method that is low-cost.

VIII. REFERENCES

[1] Shaik Khadar Basha and P. Sireesh Babu conducted an investigation titled "WIRELESS BLACK BOX FOR ACCIDENTAL MONITOR IN VEHICLES." This study took place at the Department of Electronic and Communication Engineering, Prakasam Engineering College, in Kandukur Mandal, Prakasam District, AP, India. The detailed findings of their research were documented in the International Journal of Professional Engineering Studies, Volume I, Issue 2, in December 2013.

[2] In 2019, Monisha J Prasad, Arundathi S, Nayana Anil, and Harshikha explored the "Automobile Black Box System for Analyzing Accidents" within the Department of Electronics and Communication in India.

[3] Brian Lee, Yvonne Shin, and Hyun Joo Bae made significant contributions with their research on the "Development of an System for Insurance Servers Utilizing Vehicle Driving Data." This study was showcased at the 7th IEEE International ICCCT in 2019.

[4] Watson, N., Louis, T., and Tranont, A., explored the "Wireless Black Box Utilizing Accident Monitoring In Vehicles." Their discoveries were presented at the IEEE-EMBS International Conference On BHI in 2020.

[5] Rajinder Singh, Simranjit Sethi, and Akash Biswal, Kumar Pattanayak, "A Smart Anti Theft Enhancing Vehicle Safety Exploring Advanced Systems, Mechanics, and Manufacturing, Vol.3, No.4, November 2015.

[6] A Ayers, Whitaker, and Dressel reported in 2018 that according to NHTSA, almost all car crashes result from human error. The details are available at https://www.ayersandwhitlow/blog/2018/01/nhtsa-nearly-all-car-crashes-are-due-to-human-error/.

[7] A. Z. M. T. Kabir, A. M. Mizan, P. K. Saha, M. S. Hasan, and M. Pramanik introduced "An IoT-based intelligent parking system for the unutilized parking area with real-time monitoring using mobile and web application" in the Asian Journal of Convergence in Technology.

[8] E. Jaidane, M. Hamdi, T. Aguili, and T.-H. Kim presented "An infrastructure vehicle black box system" at the 2018 International Conference on Internet of Things, Embedded Systems, and Communications (IINTEC).

[9] A. John and P. R. Nishanth discussed the "Real-time embedded system for accident prevention" at the 2017 International Conference of Electronics, Communication, and Aerospace Technology (ICECA).

[10] A. Kumar, N. Anusha, and B.S.S.V. Prasad developed an "Automatic toll payment, alcohol detection, load, and vehicle information using Internet of things & mailing system" and presented it at the 2017 International Conference on Intelligent Computing and Control (I2C2).