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Control and Monitoring of Electrical Vehicle and Motor

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Abstract: ***EV, the major problem that occurs is the burning of EV. After burning of the EV there are no data available for analysis, for that purpose we have proposed a system to address this issue. Inside that, we use different sensors to collect data such as temperature, voltage, current, humidity of motor and battery. Also, from the safety point of a view we have used GSM Module, GPS module, Flex sensor and LDR sensor. Which will help to find the exact location of an accident and provide emergency service.***
Keywords: Control and Monitoring, IOT, GSM, Black Box, GPS.

I. INTRODUCTION

Every year, more than a million people worldwide die from transportation-related accidents, according to the World Health Organization. To address this problem, the black box system was developed as the first step in improving road safety across national boundaries [1].

While the black box system was first introduced to a portion of the United States market in 1999, it has since proven to be an efficient tool for investigating accidents and helping insurance companies with their investigations [2]. Black box technology, similar to the flight data recorders used in aircraft, is now increasingly used in motor vehicle crash investigations [3].

Many vehicles already contain electronic systems that record information during a crash, making it important to have objective recordings of what happens before, during, and after the event to complement subjective inputs such as eyewitness accounts and police reports [4]. The black box system has two main approaches: detecting and recording data from the vehicle, and presenting the recorded data to the user in a simplified way [5].

To detect and record data, major components and different types of sensors are used [6]. To present the data, a Visual Basic. Embedded C computer program is used to receive the data serially from the black box memory, display it in real-time graphics, and save it to a formal excel report for future use [7]. In addition to improving treatment for crash victims and road conditions, constructing safer vehicles, and aiding in accident investigations, the development of a black box system that can be installed in any vehicle worldwide can greatly improve road safety [8].

II. PROBLEM STATEMENT

As the adoption of electric vehicles and motors continues to grow, the need for effective control and monitoring systems becomes increasingly critical. However, the implementation of such systems presents emerging challenges, including the need for improved battery management systems to address issues such as range anxiety and battery degradation [9]. Additionally, the use of advanced power electronics and sensors raises concerns regarding their reliability and cybersecurity. This paper explores these emerging problems and proposes potential solutions for ensuring the efficient and safe operation of electric vehicles and motors [10].

III. LITERATURE SURVEY

1) Automobiles based black-box system using IoT S. Monika VOLUME: 08 ISSUE: 04 | APR 2021. The black-box system, derived from the aviation industry, is an electronic recording device used in aircraft for investigating aviation accidents and incidents. Our project aims to create a similar device for automobiles using IoT technology. This device will not only aid in post-crash analysis but also in quickening emergency rescue operations. Our research is focused on developing an integrated system for emergency rescue services following a road accident. The device will be cost-effective, and with the help of GPS technology, it will determine the accident location and send it via the internet to a pre-programmed emergency number. This will significantly reduce the response time of emergency rescue teams.
2) A Black Box with SMS Alert for Road Vehicles Ranjitha S L NCESC - 2018 Conference Proceedings The concept of the Black Box, derived from the aviation industry, is an electronic device used in aircraft for recording flight data to aid in investigating

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accidents and incidents. Our project aims to create a similar device for road vehicles, which will not only aid in post-crash analysis but also in quickening emergency rescue operations. Our research is focused on developing an integrated system for emergency rescue services following a road accident. The system uses a GPS module to determine the accident location and a GSM module to send the location via message to a pre-programmed number. This device is installed in the vehicle and will significantly reduce the response time of emergency rescue teams.

IV. EXISTING SYSTEM

There are various proposed solutions to address the problem at hand, each with its unique advantages. One current solution is the implementation of a tracking system in vehicles to prevent accidents and preserve human life. This system utilizes a microcontroller. However, such monitoring systems are only present in high-end vehicles due to their costliness [10].

V. BLOCK DIAGRAM

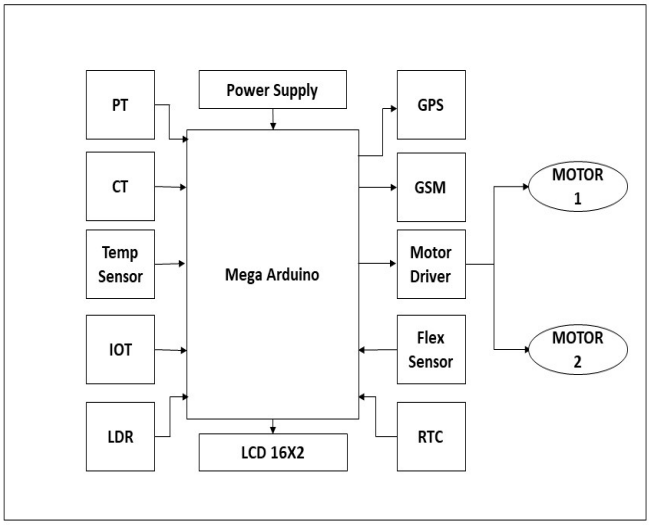


Figure 1: - Block diagram of Proposed system.

VI. HARDWARE SECTION AND WORKING

The proposed system is a prototype of an automobile black box system that can be installed into vehicles. The system includes measures to improve security by preventing damage to black box data. An IoT module is used to update battery and motor parameters of the vehicle on the cloud [21].

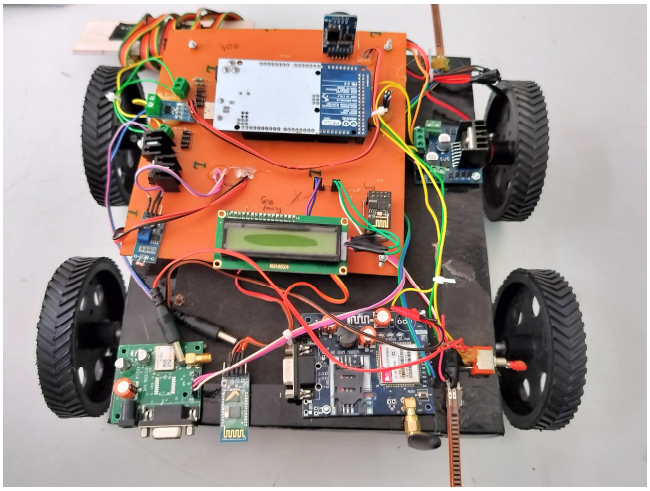


Figure 2: - Proposed Model.

The black box provides information on the cause of accidents in remote areas, such as hill stations, and can inform nearby hospitals, traffic control, or ambulance of the accident location.

The transmitter side of the system uses GSM to send relevant alert messages to nearby safety sources, and sensors are included for safety purposes. The LCD display is used to show the stored data. The black box, which includes basic data recording features, is useful for electric vehicles and also includes advanced web tracking features that can be accessed from anywhere.

The system uses an Arduino (ATmega2560) microcontroller as the "brain" of the system, as it stores the program instructions. Temperature, flex, LDR, CT, and PT sensors are used to monitor vehicle status, as well as voltage, current, and temperature of the motor and battery. The GSM module is used to inform relatives and nearby ambulances. All data is updated to the cloud, allowing for remote control or monitoring using IoT technology [12].

A. Working

1) Hardware Setup

The hardware setup includes the following components: -

a) GSM module for communication.
b) GPS module for detecting the accident location.
c) Flex sensor to determine the side of the accident.
d) Arduino Mega for central monitoring and control system.
e) Motor driver for controlling the speed and direction of the motor.
f) Temperature sensor to monitor the temperature of the motor and battery.
g) IoT module for storing data on the cloud.
h) LDR to detect the upper light of the vehicle.
i) RTC for tracking the travel distance of the vehicle.
j) CT for measuring the current of the motor and battery.
k) PT for measuring the voltage of the motor and battery.

2) LCD Initialization: Upon vehicle startup, all battery and motor parameters are displayed on the LCD.

3) Accident Detection: In the event of a sudden accident occurring on the front or back side of the vehicle, the flex sensor will bend, indicating the incident on the LCD display. Additionally, an SMS will be immediately sent to relatives to request emergency services.

4) Data Storage: To address the issue of data loss in case of EV fire incidents, data is stored on the cloud. The IOT ESP8266 module is utilized for this purpose.

5) Controlling of EV: The temperature sensor senses the temperature of motor and give signal to the Arduino through the motor driver to control speed of motor. If temperature of motor is greater than the curie temperature the magnet in DC motor is demagnetize.

VII. FLOW CHART

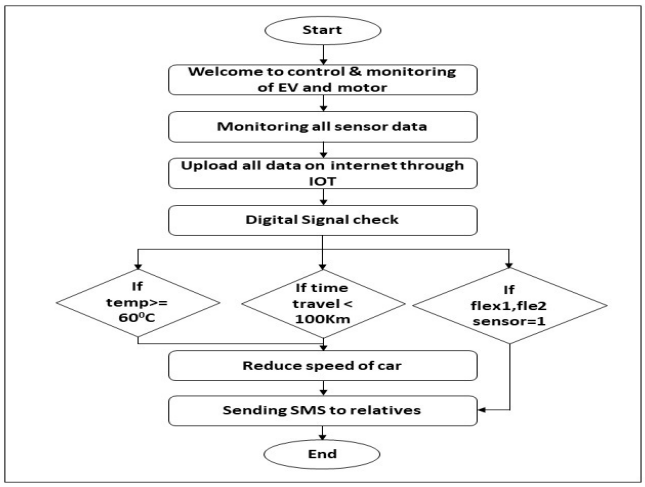


Figure 3: -Flow Chart of proposed system.

VIII. EXPERIMENTAL RESULT

The result of proposed system is classified into three sections: -

1) *Vehicle Section:* The vehicle section of the system includes a Mega Arduino, and multiple sensors such as LM35 temperature sensor, flex sensor, CT, PT, LDR sensor, IOT module, GPS module, GSM Module, RTC, Motor driver, motor, Battery and LCD. The sensors are used to capture data during an accident, which can be helpful in post-accident investigations. The recorded values are stored on the Cloud and displayed on the LCD. Additionally, the SIM900 GSM module is used to send a message to the user in case of an accident.
2) *Controlling Section:* After controlling of motor.



Figure 4: - Speed Control of Motor

3) *Experimental Result*

The below fig shows the result of proposed system.

a) When system in ideal state and Accident happen.

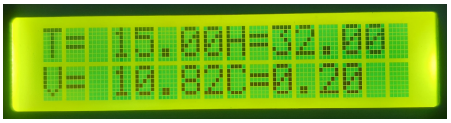


Figure 5: - Monitor Parameter Display on LCD Display

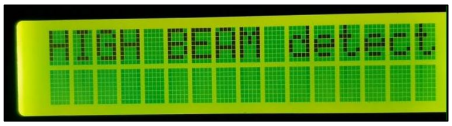


Figure 6: - Upper Dipper light control



Figure 7: - Vehicle Accident detected by back side

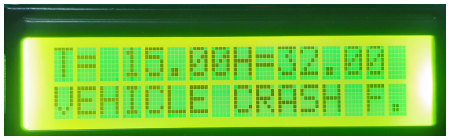
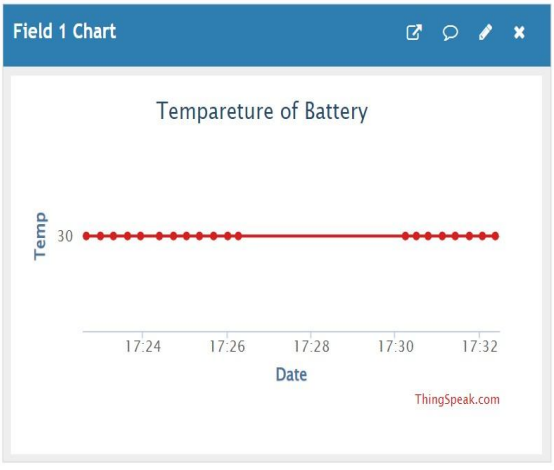


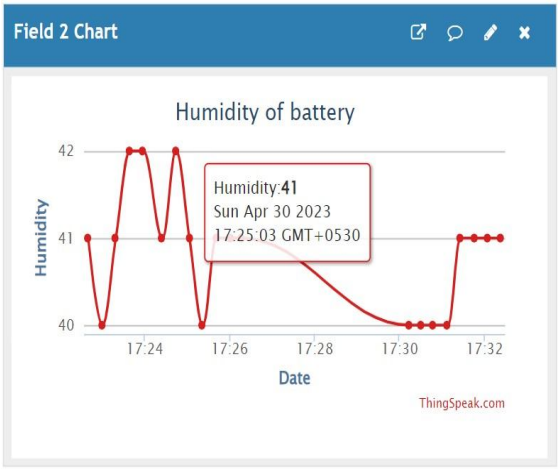
Figure 8: Vehicle Accident detected by front side

b) Data uploaded on internet in visualisation form: -

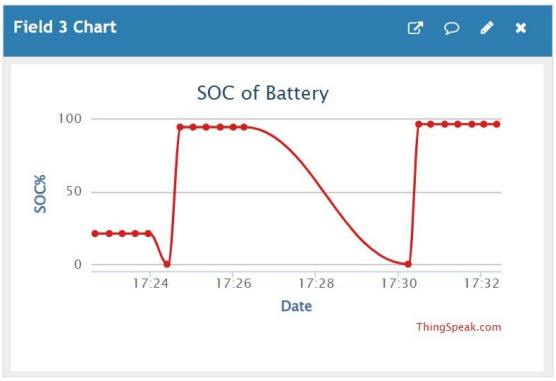
- *Battery Parameter*



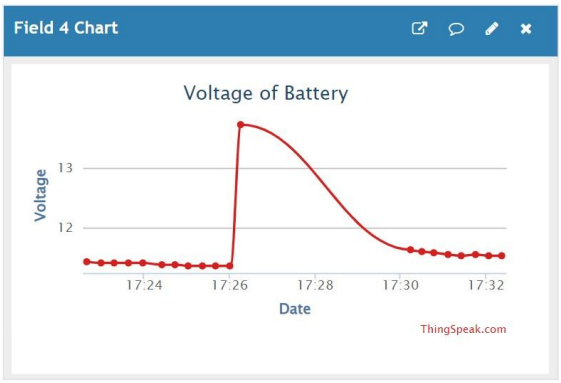
Graph 1: - Temperature of Battery



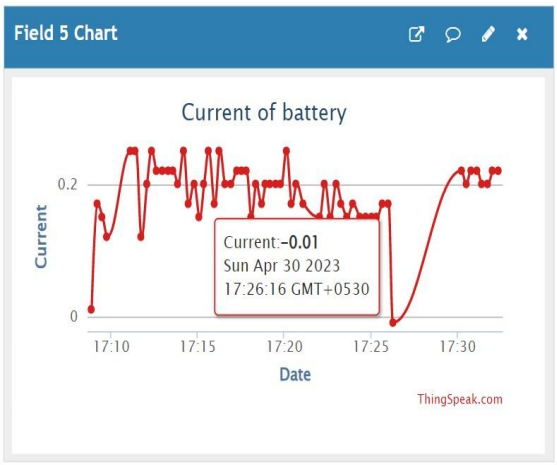
Graph 2: - Humidity of Battery



Graph 3: - SOC of Battery



Graph 4: - Voltage of Battery



Graph5: - Current of Battery

- Motor Parameter



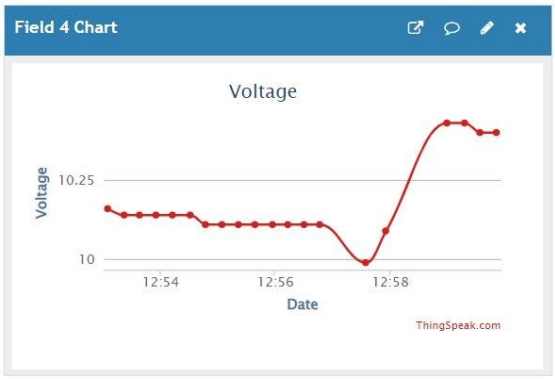
Graph 6: - Current of Motor



Graph 7: - Humidity of Motor



Graph 8: - Temperature of Motor



Graph 9: - Voltage of Motor

IX. ACKNOWLEDGEMENT

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X. CONCLUSION

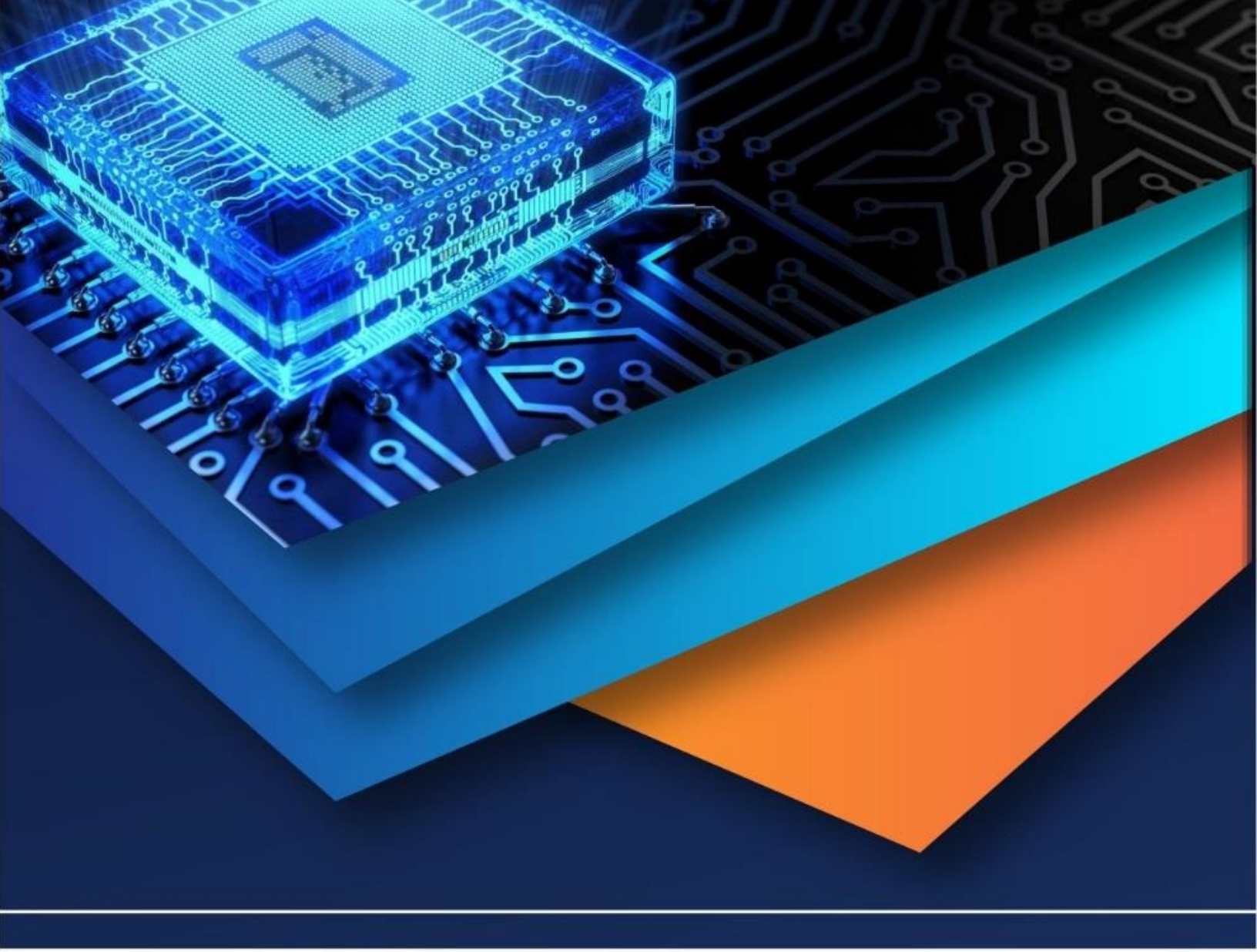
The CONTROL AND MONITORING OF ELECTRICAL VEHICLE AND MOTOR system was successfully implemented, comprising an Arduino-Mega board, GPS Module, GSM Module, various sensors, and IoT module. The system is designed to be user-friendly. Furthermore, the project has achieved its objectives, which are as follows:

1) Determining the precise location of accidents.
2) Transmitting data to the internet via the IoT module.
3) Monitoring and controlling the motor in the event of a temperature increase.
4) Regulating the Upper (High Beam) Dipper light of the electric vehicle.
5) Providing emergency services to accident areas.

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