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Crash and DUI Evidence Collector using Arduino Mega 2560

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***Abstract*— Crash and DUI evidence collector presents an advanced vehicle safety system designed to detect potential accidents and hazardous driving conditions, using a combination of sensor technologies and real-time alert mechanisms. By integrating temperature, vibration, alcohol, and gyroscopic sensors with a GPS and GSM module, this system captures data on vehicle status, driver condition, and environmental factors that may lead to an accident. The gathered information is processed to generate immediate SMS alerts to designated contacts, improving response time and enhancing overall safety. Additionally, the system records data for later analysis, supporting crash reconstruction and identifying preventive measures. The project aims to reduce accident rates and improve driver safety with the use of IoT, data analytics, and mobile communication.**

Keywords-Vehicle safety, accident detection, sensor technology, real-time alerts, GPS, GSM module

INTRODUCTION

In recent years, road accidents have become a significant public health concern, leading to high mortality rates, injury, and economic losses worldwide. Traditional safety mechanisms in vehicles, although effective to some extent, often lack proactive measures that could prevent or reduce the impact of accidents. With advancements in technology, especially in IoT (Internet of Things) and real-time data communication, there is potential to create systems that not only detect but also prevent hazardous driving conditions. This project aims to develop an intelligent vehicle safety system that uses a range of sensors to monitor key parameters such as vehicle speed, driver alcohol levels, environmental temperature, and vehicular stability.

The system integrates sensors for temperature, vibration, alcohol detection, and gyroscopic analysis, along with GPS and GSM modules for location tracking and real-time alerting. When hazardous conditions or potential accidents are detected, the system immediately sends an SMS alert to predefined emergency contacts with details of the incident, thus enabling faster response times. Additionally, the system stores data for post-incident analysis, which can be invaluable for crash reconstruction and understanding the dynamics of the incident. By providing an intelligent blend of detection, prevention, and real-time communication, this system has the potential to reduce accident-related fatalities and enhance overall road safety.

This device explores the implementation, and testing of this vehicle safety system, detailing the role of each component, the process for hazard detection, and the impact of real-time alerts on emergency response times. The system's data collection capabilities also highlight its potential applications for both individual and broader traffic

safety insights, paving the way for future advancements in intelligent transport safety systems.

This advanced vehicle safety system addresses the urgent global issue of road traffic crashes, which annually cause 1.3 million fatalities and significant economic losses. By providing real-time alerts via SMS and storing comprehensive sensor data, the system aims to mitigate accident risks and improve response times. It supports timely intervention for drunk driving, fire, and accidents, while enabling detailed post-incident analysis to understand and prevent future occurrences. Powered by an Arduino Mega, this technology promises to enhance road safety measures by leveraging modern sensor capabilities and proactive communication strategies, thereby reducing societal costs and preserving lives worldwide.

An app connected to the cloud can provide information on available parking spaces, underscoring the necessity of developing a cloud-integrated smart parking system. Such a system can significantly aid vehicle users in locating parking spaces with greater ease. Data from this system can be transmitted to mobile phones or other applications, empowering communities to remotely and continuously monitor unoccupied parking lots in real time.

LITERATURE SURVEY

Title: *Design and Implementation of an Accident Detection and Alert System for Vehicles*
Authors: S. Jadhav, S. Gaikwad, P. Deshmukh
Publication: International Journal of Engineering Research & Technology (IJERT), 2022
Findings:
This study focuses on the development of a vehicle accident detection system utilizing an accelerometer and GSM module with Arduino. The accelerometer is used to detect sudden impacts that may indicate a collision, while the GSM module is employed to send real-time SMS alerts to emergency contacts. The integration of these components with Arduino allows for a cost-effective and efficient system for accident detection and alerting. This research is foundational in demonstrating how basic components can be used to provide immediate notification in case of accidents, potentially reducing response time for emergency assistance.

Title: *Vehicle Accident Detection and Reporting System Using GPS and GSM*
Authors: N. Swamy, S. Naidu, M. Devi
Publication: International Journal of Emerging Trends in Engineering Research (IJETER), 2022
Findings:
This paper describes an accident detection system that uses GPS and GSM modules along with Arduino to enable real-time reporting of vehicle accidents. When an accident is detected, the GPS module determines the vehicle's location, while the GSM module sends the location coordinates and other relevant data to emergency responders or predefined contacts. This approach is particularly useful for reducing the response time in emergencies, especially in remote areas where locating the accident site might be challenging.

Title: *Real-Time Vehicle Accident Detection and Prevention Using Arduino*
Authors: A. Patel, V. Gupta, S. Singh
Publication: Proceedings of the International Conference on Smart Systems and Inventive Technology (ICSSIT), 2021
Findings:
This paper discusses a system that detects vehicle accidents in real-time through various sensors integrated with Arduino. The system incorporates an accelerometer to detect impacts, a gyroscope for monitoring orientation, and other sensors for comprehensive data collection. The study highlights the importance of real-time processing

in accident detection and suggests potential measures for accident prevention, such as alerting the driver or slowing down the vehicle. The focus on both detection and preventive actions makes this research significant for developing proactive safety systems.

Title: *Implementation of an Intelligent Vehicle Accident Detection System Using Arduino and GPS*
Authors: D. Kumar, A. Verma, S. Prasad
Publication: International Journal of Computer Applications (IJCA), 2021
Findings:
This paper focuses on developing an intelligent accident detection system using GPS for location tracking and Arduino for data processing. The system detects accidents based on inputs from accelerometer and gyroscopic sensors, with GPS providing location data upon detection. The study emphasizes the system's ability to generate alerts that include precise location details, facilitating faster responses from emergency services. This work demonstrates how combining Arduino with GPS can create a robust accident detection system, especially suited for real-time location tracking.

Title: *Design and Development of Vehicle Crash Detection System Using Arduino*
Authors: L. Nguyen, T. Tran, K. Ho
Publication: IEEE Sensors Journal, 2020
Findings:
This study explores the design and implementation of a vehicle crash detection system using accelerometers. The system is built with Arduino as the central control unit, where accelerometers detect sudden impacts indicative of a crash. The study highlights the precision of accelerometers in detecting collision events and discusses methods for filtering out false positives. By focusing on hardware optimization, this research provides insights into designing a reliable crash detection system using minimal hardware, which is valuable for cost-effective safety solutions.

PROPOSED SYSTEM

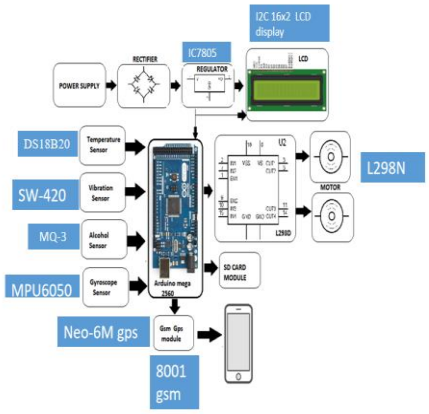

Figure 1: Basic Module

1Power Supply and Regulation:
-The system is powered by an external power supply, which provides the necessary voltage to operate all components.
-A rectifier converts AC to DC if needed, ensuring stable DC power is available for the circuit.
-The voltage regulator ensures a constant voltage level, preventing voltage fluctuations that could harm the sensors and modules connected to the Arduino Mega 2560.

2. Arduino Mega 2560
-The Arduino Mega 2560 is a powerful and popular microcontroller board that is especially suited for complex projects, including those involving multiple sensors and actuators, such as vehicle accident detection system

3. LCD Display:
- The LCD is used to show real-time information about the temperature and alcohol. It could display

messages such as temperature , alcohol content,gyroscopic data. The information on the display is updated based on the data received from the Arduino Mega 2560.

4. Servo Motor:
- The servo motor is likely used to control the movement of the wheels of the vehicles. And decelerate after any collision.

5. Power Supply
- The power supply component provides the necessary electrical power to all the components in the system, ensuring that the sensors, Arduino Mega , LCD, and servo motor operate correctly.

CIRCUIT DIAGRAM

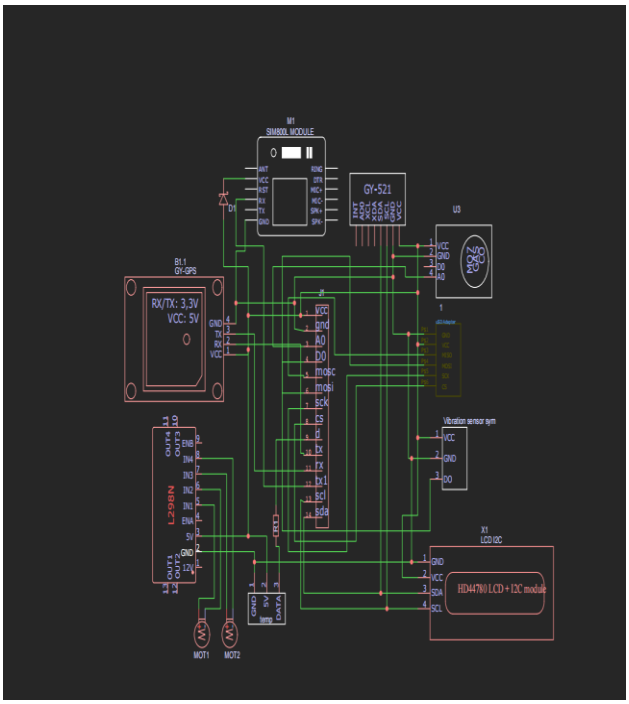

Figure 2: Schematic Evidence and DUI collector

METHOLODGY

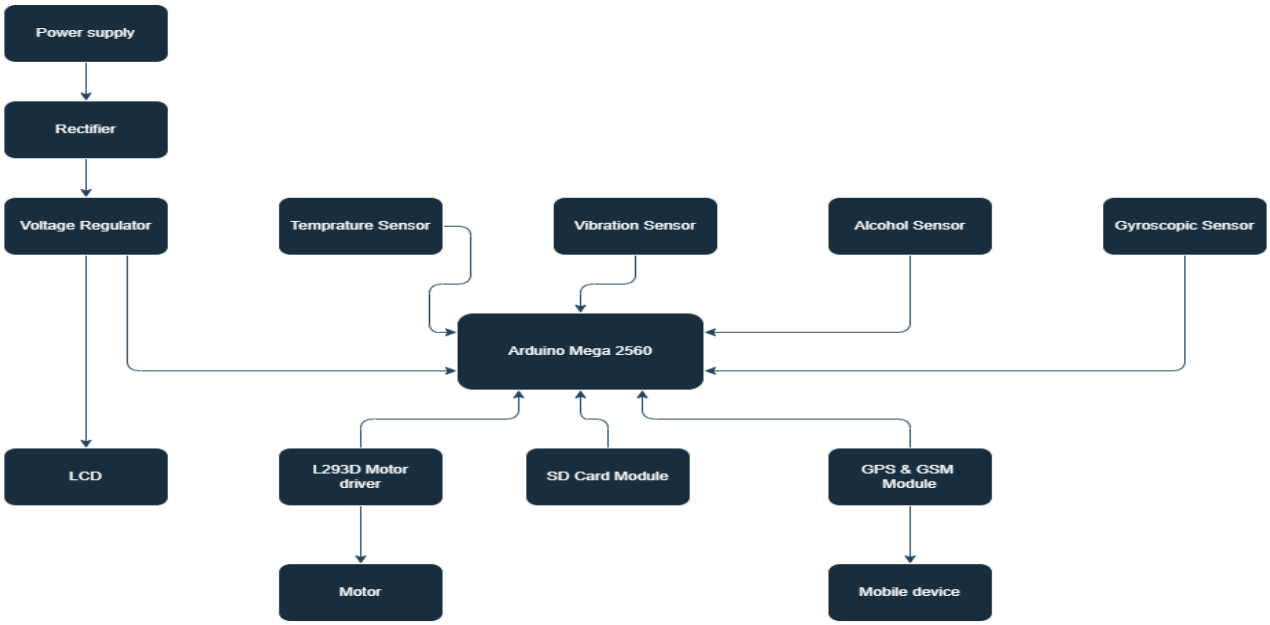

Figure 3: Working of system

1. Power Supply and Regulation:

The system is powered through a regulated power supply, ensuring stable voltage to prevent damage to components.

Power is filtered and controlled through a rectifier and voltage regulator.

2. Sensor Initialization:

Multiple sensors are connected to the Arduino Mega 2560, including temperature, vibration, alcohol, and gyroscope sensors.

These sensors continuously monitor environmental and vehicle conditions.

3. Data Processing:

The Arduino Mega 2560 processes data from each sensor in real time.

The data is analyzed for any anomalies that could indicate an accident, such as high vibration, alcohol detection, or sudden directional change.

4. Accident Detection and Response:

If an accident is detected based on sensor inputs, the system activates the GSM and GPS modules to send alerts.

A notification is sent to a predefined mobile device, including location data for assistance.

5. Logging and Motor Control:

The SD Card Module logs critical data for post accident analysis.

6. Display Output:

The LCD provides real-time feedback on system status and detected anomalies for the driver or operator.

CONCLUSION AND FUTURE SCOPE

The vehicle safety system project provides a comprehensive approach to enhancing road safety through real-time detection of hazardous conditions and potential accidents. By integrating multiple sensors (temperature, vibration, alcohol, gyroscopic, and GPS/GSM), the system ensures early warning notifications through SMS, helping to prevent accidents. The data collected during the journey offers valuable insights into vehicle conditions and driver behavior, making it a crucial tool for improving road safety. The future scope of the vehicle safety system includes integrating it with autonomous vehicles for enhanced decision-making, utilizing machine learning for accident prediction, and expanding the sensor network to include fatigue or weather detection. Cloud-based data storage can improve data accessibility and analysis, while linking the system with advanced driver assistance systems (ADAS)

FINAL SYSTEM

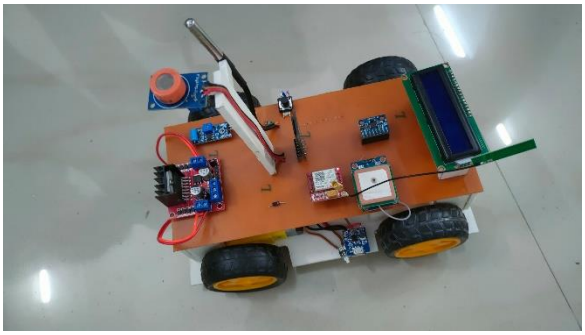

Figure 4: Final model

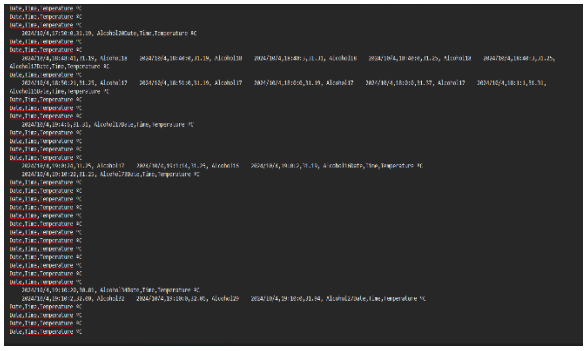

Figure 5: Recordings

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