IOT Based Automatic Vehicle Accident Detection And Rescue System Using GPS And GSM Networking

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Abstract- *The IoT based Automatic Vehicle Accident Detection and Rescue System is a smart system that utilizes GPS and GSM networking to automatically identify vehicle accidents and alert emergency services for fast rescue operations. This device combines a micro controller unit with sensors to identify car accidents based on the force, vibrations and orientation of the hit. The GSM module uses the position information it receives from the GPS module to send an emergency alert message to the appropriate authorities, including the precise location of the vehicle. The proposed system can speed up emergency services' response times, which is essential for saving lives in accident scenarios.*

I. INTRODUCTION

Nowadays, many accidents occur on highways as a result of increased traffic and reckless driving by drivers. In many cases, the family members, ambulance and the police authority are not notified on time. As a result, assistance to the individual who has been injured in an accident is delayed. Our project Automatic Vehicle Accident Detection using GPS and GSM Networking is intended to avoid such occurrences. The fast advancement of technology and infrastructure has made our lives easier. The growing demand for automobiles has also exacerbated traffic risks and road accidents. The people's lives are in real danger. The delay of reaching the ambulance to the accident site, as well as the traffic congestion between the accident site and the hospital, increases the victim's chances of dying. Our automatic ambulance rescue technology comes to the point to solve this problem.

The demand for vehicles has expanded dramatically as the population has grown, producing an alarming situation in terms of traffic dangers and road accidents. The number of fatalities caused by vehicle accidents is increasing at an alarming rate. The fundamental cause of the higher rate of mortality, however, is the delay in emergency assistance. Many lives could be saved if rescue services were more efficient. The delay is caused by traffic congestion or poor contact with the medical units. The use of automatic road accident detection systems to provide prompt assistance is critical. In the literature, numerous solutions for automatic accident detection have been proposed. Crash prediction employing smartphones, car adhoc networks, GPS/ GSM-based systems, and other machine learning algorithms are among the methods employed. With such high rates of fatalities related with traffic accidents, road safety is the most critical sector that requires extensive research. We give a critical study of different existing approaches for forecasting and avoiding road accidents in this paper, stressing their strengths, limits, and difficulties that must be addressed to ensure road safety and save important lives.

A system that uses GPS and GSM networking to enhance emergency response time to vehicular accidents is an IoT-based automatic vehicle accident detection and rescue system. The system detects accidents and automatically alerts emergency services by combining hardware and software components.

II. LITERATURE REVIEW

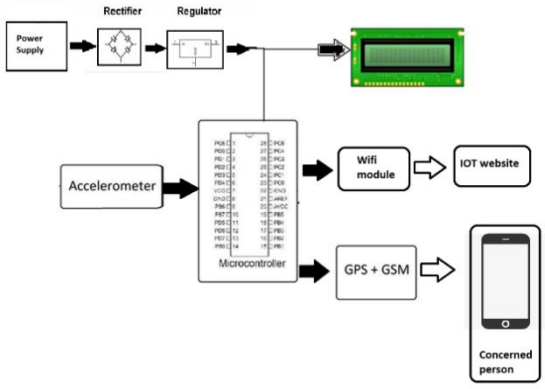
Research that and explore IoT-based systems for automatic car accident detection and rescue using GPS and GSM technologies are included in the literature study. In their study, [1] Gupta and Singh (2021) suggest an Internet of Things (IoT)-based system for detecting and responding to car accidents that makes use of GPS, GSM, and accelerometer sensors. Regarding the study by [2] Manogna and Sahoo (2021), their suggestion on Internet of Things (IoT)-based system for automatic car accident detection and rescue using Raspberry Pi, GPS, and GSM technologies.

In their research study, [3] Ahmed and Zaman (2021) suggest an intelligent Internet of Things-based system for detecting and responding to car accidents that includes a microcontroller, GPS, GSM, and accelerometer sensor. The project study by [4] Reddy and Jyothi (2021) suggests an Internet of Things (IoT)-based system that makes use of GPS, GSM, and machine learning methods for precise car accident detection and prompt response. According to study by [5] Singh and Singh (2021) offers a thorough analysis of several IoT-based vehicle accident detection and rescue systems that make use of GPS and GSM technologies, covering their operational principles, benefits, and drawbacks. Based on

study by [6] Karthick and Balakrishnan (2020) suggests an intelligent Internet of Things (IoT)-based system that offers real-time monitoring of vehicle parameters in addition to spotting and reacting to vehicle accidents.

Overall, the literature study emphasises the value of Internet of Things (IoT)-based systems for automatic car accident detection and rescue, as well as the function of GPS and GSM technologies in enhancing the precision and responsiveness. These studies also show the potential for adding more sensors and using machine learning techniques to detect car accidents more precisely and respond to them more quickly.

III. HARDWARE IMPLEMENTATION



A. *Integration of GPS module:*

An integral part of an IoT-based automatic car accident detection and rescue system is the integration of a GPS module. For quick rescue efforts in the event of an accident, the GPS module offers precise location information for the car. The GPS module gathers signals from GPS satellites and determines the location and speed of the moving object.

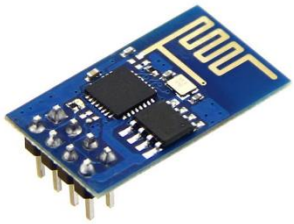
A GPS module needs to be attached to the micro controller unit in order to be integrated into the system. Latitude and longitude coordinates are included in the data that the GPS module sends. After processing this data, the microcontroller unit transmits it to the GSM module, which notifies the emergency services of the accident's location.

B. Integration of GSM module:

Integration of a GSM module is an essential component of an IoT-based automatic vehicle accident detection and rescue system. The GSM module allows the system to send

emergency alerts to the concerned authorities or emergency services in case of an accident.A GSM module needs to be attached to the micro controller unit in order to be integrated into the system. The micro controller unit transmits an alert message to the GSM module that includes the GPS module's location data as well as other pertinent details regarding the collision, such as the vehicle's speed, direction, and force of impact. The GSM module subsequently sends the alert message to the emergency services or concerned authorities over the mobile network. The GSM module must be guaranteed to work with the mobile network in the region where the vehicle will be operating. The micro controller unit must be able to transmit the module the alert message by using AT commands, so the module must also implement the required communication protocols.

C. Integration of Micro controller and Wifi module:



An integral part of an IoT-based automatic car accident detection and rescue system is the integration of a micro controller and Wi-Fi module. The system's central processing unit is the micro controller, and the Wi-Fi module enables the system to communicate with the internet and transfer data to a cloud server.The micro controller must be designed to read data from sensors like the GPS and

accelerometer sensors and transfer the data to the cloud server using the Wi-Fi module in order to be integrated into the system.The data collected from several vehicles can be stored on the cloud server, which can also analyse the data to find accident-prone locations, examine occupant driving patterns, and provide suggestions for improvements to reduce accidents.In addition, the Wi-Fi module can be utilized to offer remote access to the system, enabling authorized staff to check on the system's operation and make configuration changes from a distance.To handle the data from the sensors and interact with the cloud server, the micro controller and Wi-Fi module must be compatible with one another and have enough processing power and memory.

D. Integration of Accelerometer:

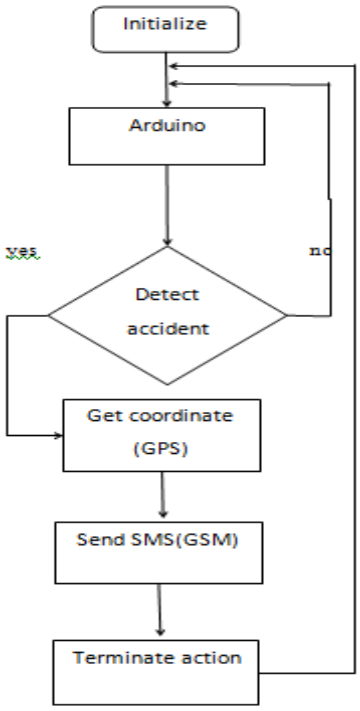
The accelerometer detects the vehicle's acceleration and deceleration, which can be used to identify accidents and offer important information about the speed and motion of the vehicle.The accelerometer needs to be connected to the micro controller unit in order to be integrated into the system. In order to identify any abrupt changes in the vehicle's acceleration, such as a quick slowdown or change in direction, the micro controller unit reads the data from the accelerometer and analyses it. These alterations may be signs of an accident.When the micro controller notices an accident, it can turn on the GPS module to obtain the vehicle's location information and activate the GSM module to transmit an emergency alarm. Information on the vehicle's location, travel speed, and its identification number might all be included in the alarm message.

E. Integration of 16*2 LCD display:

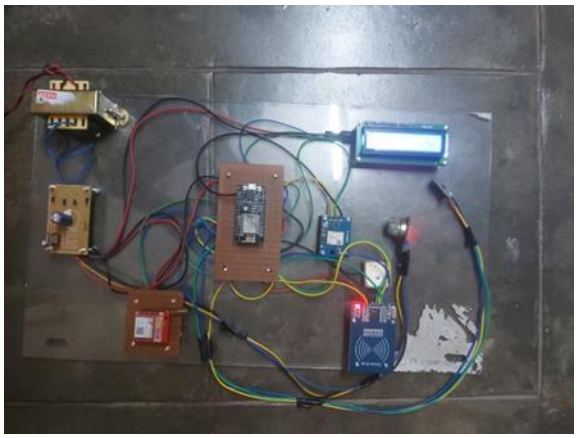
The location of the car right now, its speed, when the accident happened, and how severe the hit was can all be displayed on the LCD screen. The micro controller unit can activate the LCD display to present an alert message informing the user that an accident has happened when one occurs. The notification may provide details regarding the collision, such as the car's position, the force of the hit, and the speed at which it was travelling. The LCD display can be used to show other information in addition to accident data, such as the system's status, the GSM module's signal strength, and the GPS module's condition.

ALGORITHM

A. Flow chart:



B. Working Explanation:



The IOT assembly consists of transformer, resistor, capacitor, Radio Frequency Identification (RFID), Wi-Fi module ESP 8266, GPS module, GSM module, Micro controller, Accelerometer, MQ3 sensor, LCD display.

Since the working model is a prototype, 240V is used as the input. Transformers, resistors, and capacitors lower 240V so that the components can operate between 5V and 24V. The micro controller, Wi-Fi module, and input voltage are all linked. In order to identify distinct users and share their personal information in an emergency, the micro controller and RFID are connected.

The MQ3 gas identification sensor was utilized to add the extra feature of identifying a person's alcohol

consumption. The LCD display indicates on whether the user consumed alcohol or not.

The accelerometer sensor is used to detect accidents. The micro controller determines whether an accident has occurred based on the signal from the accelerometer. The GPS and GSM components are turned on if an accident occurs. Then, the GPS coordinates of the location, the person's name, mobile number, and blood type are sent to the person in charge, nearby hospitals, police stations, etc.

IV. CONCLUSION

The major goal of this approach is to improve an accident victim's chances of survival. By sending an alarm message as soon as an accident happens, this device enables paramedics to arrive at the accident scene in the shortest amount of time. As a result, the communication lag is reduced and the accident victim can receive prompt medical attention. It is crucial in pinpointing the locations of accidents that happen around midnight.

V. FUTURE WORK

1. One possible enhancement is to integrate artificial intelligence (AI) and machine learning (ML) algorithms into the system. These algorithms could be used to analyze the data collected by the system and make predictions about potential accidents based on factors such as weather conditions, road conditions, and traffic density. This could enable the system to take proactive measures to prevent accidents before they occur.
2. Another enhancement could be the integration of video and image recognition technologies to enhance the accuracy of accident detection. The use of cameras installed in the vehicles could provide visual data that can be analyzed to detect accidents and assess the severity of the impact.
3. The system could also be expanded to include additional features such as real-time tracking of emergency services vehicles, automatic adjustment of traffic signals to clear the way for emergency services vehicles, and integration with smart city infrastructure to provide a seamless response to accidents.
4. In addition, the system could be integrated with other emergency services such as fire and rescue services, which could provide a more comprehensive response to accidents.

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