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Intelligent In-Car Safety Solution for Accident Detection and Response

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Abstract: *The escalating pace of technological development has given rise to an increased incidence of traffic hazards and road accidents, often exacerbated by the absence of prompt emergencyfacilities. This project proposes a comprehensive solution to address this critical issue. The primary focus is on the detection of dangerous driving behaviors utilizing an in-car accelerometer. The accelerometer is configured to receive signals, enabling the identification of severe accidents. In the event of a frontal impact, a liquid gel impact sensor comes into play, enhancing accident detection. The GPS Neo 6M module is employed to pinpoint the precise location of the incident. Additionally, the GSM 800L module facilitates the transmission of SMSalerts to the vehicle owner, ensuring immediate notification in case of an accident. To prevent false alarms or unintended notifications, a reset button is incorporated. If the driver presses the reset button within a 10-second window, the system bypasses the SMStransmission, ensuring that alerts are only sent in genuine accident scenarios. This multi-faceted approach integrates cutting-edge technologies to provide an effective and reliable solution for improving emergency response in the face of road accidents.*

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Keywords: *GSM Module, GPS Modem, Arduino UNO, Google Map Link.*

I. INTRODUCTION

In the twentieth century, the automobile industry experienced exponential growth, leading to a significant increase in the number of vehicles on the road. Unfortunately, this also resulted in a rise in the number of accidents, primarily caused by heterogeneous traffic and a lack of traffic separation. Shockingly, India has the highest number of road accident deaths globally, with 13 million fatalities reported in 2014-15 alone. These statistics only account for recorded accidents, and the actual number is likely much higher. Fortunately, modern navigation technology, such as GPS, has become an integral part of vehicle systems. [1] By utilizing various sensors, GPS can accurately locate a vehicle's position on the road network. Map Matching algorithms integrate GPS data with spatial road network data to identify the correct link on which a vehicle is travelling and determine its physical location. This technology can be utilized to detect accidents and alert Rescue Service Centers, providing immediate assistance to accident victims.

While existing accident detection and prediction systems have limitations, our system aims to automatically detect accidents and alert the nearest hospital or medical services of the exact location. Our device can detect accidents and send alert messages to rescue teams in significantly less time, potentially saving lives.

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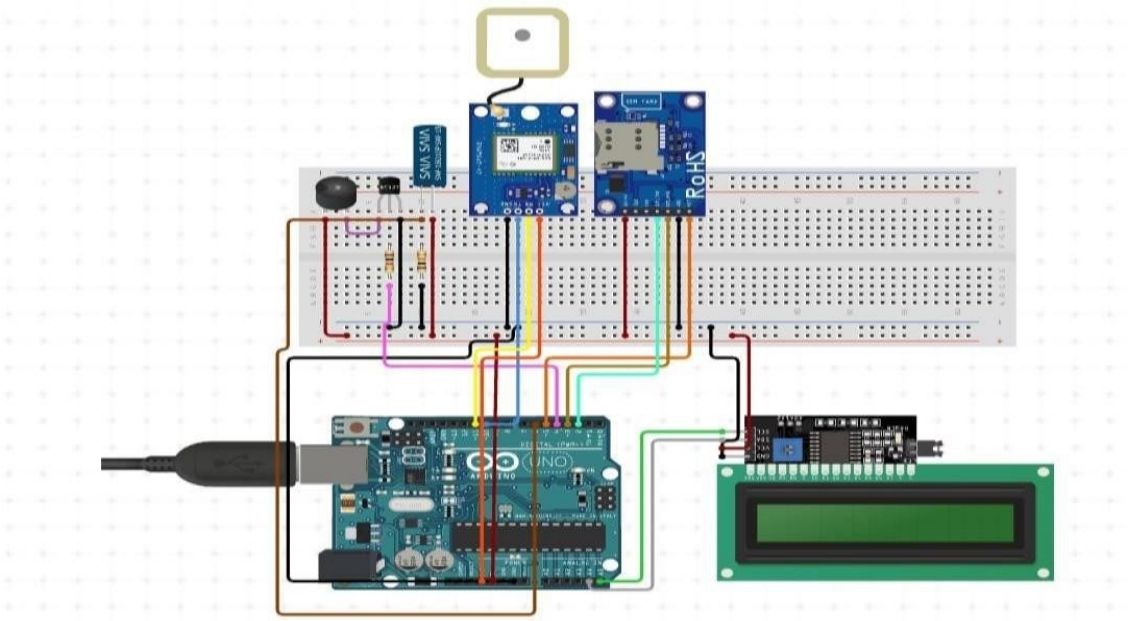

Figure 1: Basic Circuit Diagram

The alert message includes geographical coordinates, time, and angle of the accident. The device is activated by a sensor, which sends its output to the microcontroller, triggering the alert. Our project utilises a GPS and GSM module for optimal performance. As road safety continues to be a major social concern globally, our system offers a professional and effective solution for detecting and responding to accidents promptly. [1]

II. EXPERIMENTAL SET-UP

2.1) Arduino UNO:

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The Arduino is the major control unit to detect or alert when an accident occurs. It collects the data from vibration sensors, GPRS and GSM modules and reflects the output either in the display system or through a message. Here the vibration sensor plays a major role. This vibration sensor will receive the vibrations of the vehicle which in turn acts as an accident detection module. Arduino gathers the information from all other modules and sends the message to the receiver through the GSM module.

2.2) GSM SIM900 A:

The use of GSM technology in monitoring and controlling transformer load is a highly efficient and cost-effective means of communication. With its deterministic character, GSM enables the remote control of DC motors, stepper motors, temperature sensors, and solid-state relays through a simple message sent via a GSM modem. This eliminates the need for manual operation and transportation, making it an ideal solution for industrial controls, automobiles, and appliances. The SIM900A modem,

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equipped with a SIM900A GSM chip and RS232 interface, allows for easy connection to a computer or microcontroller using USB to Serial or RS232 to TTL converters. By opening a serial connection and sending AT commands, the modem can be easily configured to perform various functions. With its reliability and ease of use, GSM technology is the preferred choice for remote control and monitoring applications.[2]

2.3) GPS NEO 6M:

GPS technology has revolutionized the way we navigate and track vehicles. With tracking systems, a base station can monitor vehicle movement without driver intervention, while navigation systems assist drivers in reaching their destination. Although the two systems differ in function, their architecture remains similar. In the event of an accident, the GPS can pinpoint the vehicle's location and relay the information via GSM, alerting the relevant party through SMS or call. Our NEO 6M GPS module utilises cutting-edge technology to provide accurate positioning information, complete with a battery for faster GPS lock. It is also compatible with ArduPilot mega v2, offering optimized performance for your multirotor control platform. Trust us to provide the best GPS solution for your needs.

2.4) LCD MODULE:

To display the numbers, alphabets, and special characters an LCD module with 16x2 alphanumeric types is used. Using the higher bit data lines of LCD pins such as pins 11,12,13 and 14 are interfaced to digital pins of Arduino such as pins 8,9,10 in 4-bit mode as shown in the below figure. RS and E pins of LCD are connected to pins 12 and 13. To perform the write operation on LCD the read/write pin is connected to ground.

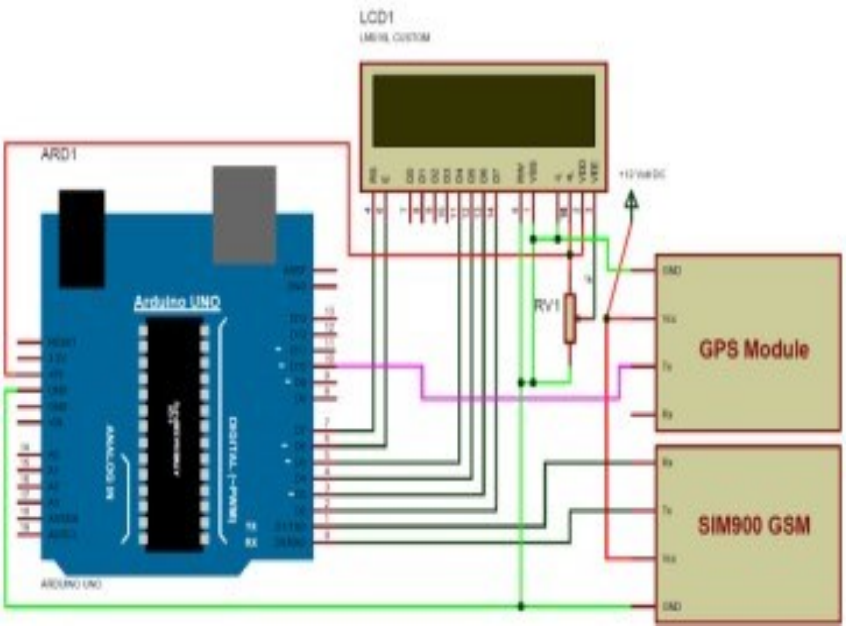

Figure 2: Working Module of Accident Detection and Alert System

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The controller used in this project is Arduino which is used for controlling all the modules in the circuit. The two major parts other than the controller are the GPS module which is used as a receiver and the other module is GSM. To receive the coordinates of the vehicle GPS module is used and GSM will send the received coordinates to the user through SMS. There is an additional LCD which is used for displaying status messages or coordinates. [2] When a person is driving the vehicle met with an accident then the vibrations of the vehicle are received by the vibration sensor the sensor acts as an accident detection module which further sends the information to the controller and the location of the vehicle is received through GPS module and the coordinates The vehicle is sent to the GSM module. The received information is sent to Arduino UNO. The received coordinate information is collected and sent to the respected person, hospitals, and police station through SMS.

III. WORKING PRINCIPLE

The entire setup will be meticulously mapped out in the form of a comprehensive block diagram. An accident sensor will be the first to detect any untoward incident and relay the information to the microcontroller. The GPS will then pinpoint the exact latitude and longitude of the vehicle, which will be transmitted via GSM to a pre-saved phone number stored in the EEPROM. A button sensor will be utilized for accident detection, and a buzzer will activate to signal system activation. Locating the exact position of the accident is crucial for timely medical assistance. The phone numbers can be easily modified by the user as needed. The microcontroller will send an alert message to the pre-saved numbers via the GSM module, and the user can pre-enter any message into the system. A clear status display will be provided on an LCD screen. In the event of no casualties, the message transmission can be terminated with a switch, which will restart the microcontroller and initiate the process anew. [3]

IV. SIMULATION RESULT

When an accident occurs the vibration sensor detects collisions and passes that signal to the microcontroller, by using GSM and GPS an SMS is sent to the registered mobile number mentioned in the code and the latitude and longitude are also sent in the form of Google maps. The message is received by the registered mobile number along with the specific location. [4]

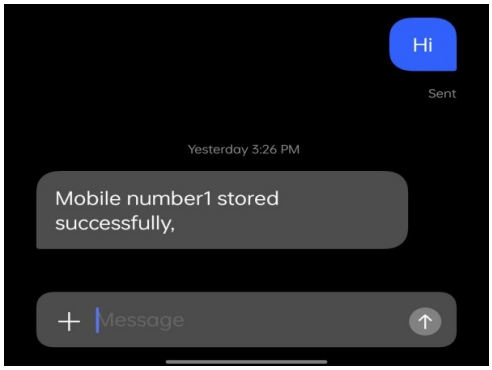

Figure 3: When Mobile Number is Stored Successfully

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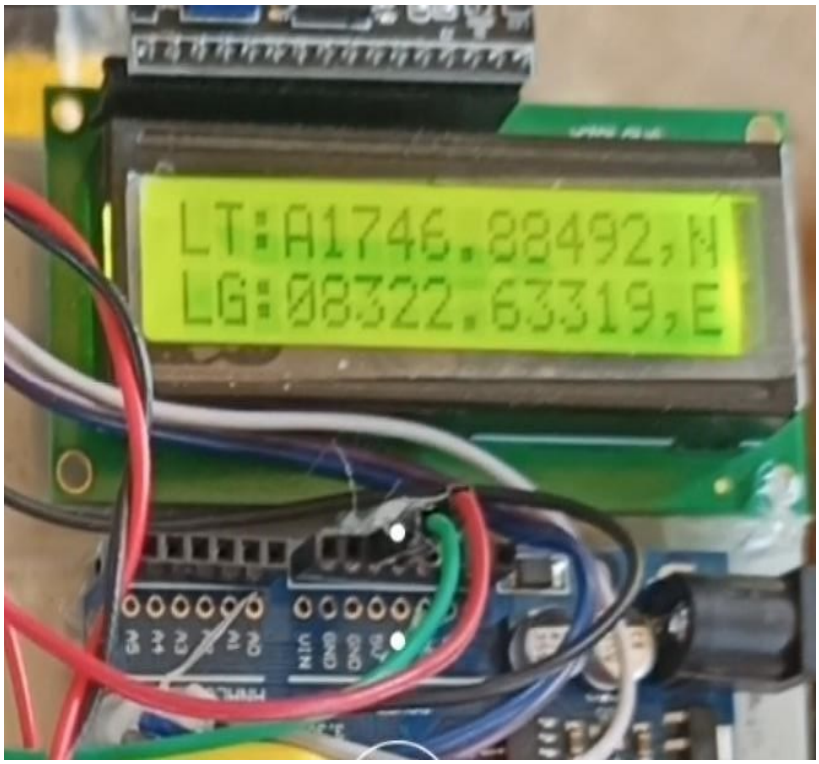

Figure 4: Latitude and Longitude Values Where the Accident Was Detected

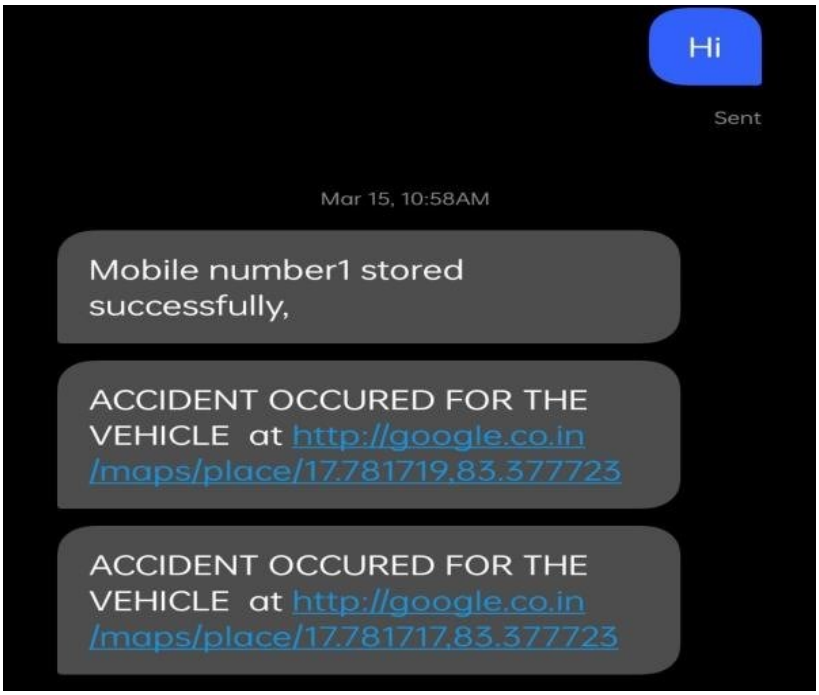

Figure 5: Message Received by the Specified Phone Number

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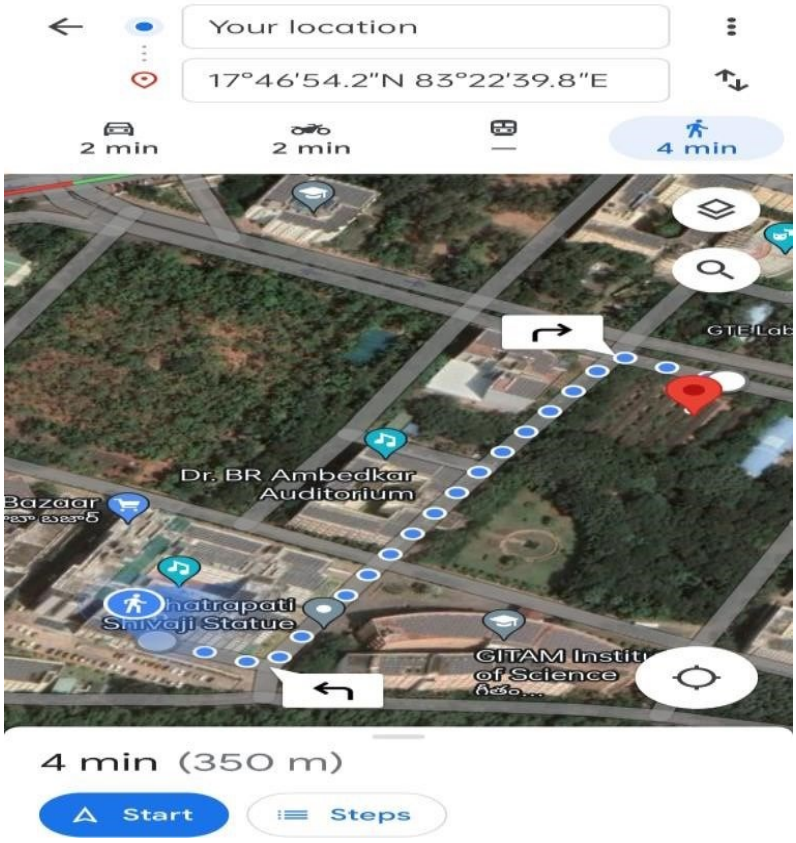

Figure 6: Location of the Accident Sent Via Google Map

V. CONCLUSION

The proposed programmed accident detection system can be a rescuer of life for people who meet with accidents. The proposed system is exceptionally easy to understand and even a non-specialized Person can use it without any problem. The system consists of equipment and programming segments. The equipment unit includes accident detection sensors that are constrained by an Arduino board and are fitted in the vehicle. Then again, the programming part is an Android application introduced in driver's Smartphones which is used to get the point-by-point map. In general, the benefits of this system are low cost, secure and simple to use. The system introduced in this work reduces the casualties due to accidents. [5]

REFERENCES

[1] Nanda, S., Joshi, H., & Khairnar, S. (2018), "An IOT-Based Smart System for Accident Prevention and Detection", 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA).

[2] Syedul Amin, M., Jalil, J., & Reaz, M. B. I. (2012), "Accident Detection and Reporting System using GPS, GPRS and GSM Technology", 2012 International Conference on Informatics, Electronics & Vision (ICIEV). doi:10.1109/iciev.2012.6317382

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[3] C K Gomathy and V Geetha, "Evaluation on Ethernet-based Passive Optical Network Service Enhancement through Splitting of Architecture", International Journal of Computer Applications 138(2):14-17, March 2016, Foundation of Computer Science (FCS), NY, USA, ISSN No: 0975-8887

[4] Wadhahi, N. T. S. A., Hussain, S. M., Yosof, K. M., Hussain, S. A., & Singh, A. V. (2018), "Accidents Detection and Prevention System to Reduce Traffic Hazards using IR Sensors", 2018 7th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO). DOI:10.1109/icrito.2018.8748458

[5] C K Gomathy and V Geetha, "A Real-Time Analysis of Service Based using Mobile Phone Controlled Vehicle using DTMF for Accident Prevention", International Journal of Computer Applications 138(2):11-13, March 2016, Foundation of Computer Science (FCS), NY, USA, ISSN No: 0975-8887

[6] Tanaya Achalkar, Shrinath Panmand, Saurabh Naik, Dilip Patil, Rachna Sonkumwar", An Efficient Approach for Accident Detection System", International Journal of Engineering Trends and Technology 67.4 (2019): 4-7.

[7] http://mtsystem.ru/sites/default/files/documents/sim800 hardware_design_v1.09.pdf

[8] Agarwal, Y., Jain, K., & Karabasoglu, O. (2018), "Smart Vehicle Monitoring and Assistance using Cloud Computing in Vehicular Ad Hoc Networks", International Journal of Transportation Science and Technology, 7(1), 60-73.

[9] Vatti, N. R., Vatti, P. L., Vatti, R., & Garde, C. (2018, March), "Smart Road Accident Detection and Communication System, 2018 International Conference on Current Trends towards Converging Technologies (ICCTCT) (pp. 1-4). IEEE.

[10] Sharma, S., & Sebastian, S. (2019), "IoT-Based Car Accident Detection and Notification Algorithm for General Road Accidents", International Journal of Electrical & Computer Engineering (2088-8708), 9(5).

