

# Implementation of Vehicle Accident Detection and Reporting System

**Bhoomika P. R. (3BR21EE014), M. Geetha (3BR21EE043), M. Sneha (3BR21EE045), N. M. Leela Sharvani (3BR21EE054)**

Department of Electrical and Electronics Engineering  
Ballari Institute of Technology and Management  
Ballari, Karnataka, India

## ABSTRACT

Road traffic accidents are a major concern, particularly when delays in accident detection and medical assistance increase the risk of fatalities. This paper presents the Implementation of a Vehicle Accident Detection and Reporting System designed to automatically detect accidents and provide rapid emergency notification. The system integrates an Arduino microcontroller with MEMS sensors, GPS, and GSM modules. The MEMS sensor continuously monitors vehicle motion and detects sudden impacts or abnormal conditions indicating an accident. Once an accident is detected, the GPS module determines the precise location, while the GSM module transmits an SMS containing the accident details and location to predefined emergency contacts and a treatment centre. The system also incorporates an LCD for status indication and audible alerts to attract nearby assistance. By providing automatic accident detection, location tracking, and immediate communication, the proposed system reduces dependence on manual accident reporting and helps minimize delays in emergency response. The developed system provides a practical and effective approach for improving vehicle safety and supporting timely medical assistance.

**Keywords**— Vehicle Accident Detection, Arduino, MEMS, GPS, GSM, Emergency Alert, Vehicle Safety.

## LITERATURE SURVEY

S. K. Sulaiman and R. N. Othman [1] proposed a Vehicle Accident Avoidance System (VAAS) using ultrasonic sensors, cameras, and radar for continuous monitoring of the vehicle surroundings. The system incorporated Forward Collision Warning (FCW), Automatic Emergency Braking (AEB), and Lane Departure Warning (LDW) to identify hazardous situations and initiate appropriate preventive actions. The study also suggested the future integration of artificial intelligence and Vehicle-to-Everything (V2X) communication to improve vehicle safety. P. B. Devkar *et al.* [2] developed an Accident Prevention System employing sensors and embedded controllers to detect obstacles and potential collisions. Their approach focused on collision warnings, automatic braking, and steering adjustments to reduce accidents caused by driver distraction and delayed human response.

M. G. Vinod and B. Durdi [3] investigated collision avoidance in vehicles using Controller Area Network (CAN), enabling real-time communication between sensors and vehicle control systems. The approach used radar, ultrasonic sensors, and cameras to detect possible collisions and transmit the information through the CAN network for appropriate safety actions. N. Kuttukaran *et al.* [4] proposed an Intelligent Accident Detection and Alert System for Emergency Medical Assistance, in which accelerometers and gyroscopes detect sudden impacts or abnormal vehicle movement. After accident detection, essential information such as GPS coordinates, incident time, and vehicle details is automatically communicated to emergency medical services. These studies demonstrate that combining sensing, embedded processing, location tracking, and wireless communication can significantly improve accident detection and emergency response.

## PROBLEM STATEMENT

Road accidents, particularly involving two-wheelers, are increasing rapidly and may result in fatalities due to delays in receiving timely medical assistance. Existing systems lack an automated and reliable method for detecting accidents, determining their severity and location, and immediately notifying emergency contacts. Therefore, an effective

accident detection and reporting system is required to automatically identify accident conditions, determine the accident location, and provide rapid notification to emergency services and concerned persons.

## OBJECTIVES

1. To automatically detect vehicle accidents using a MEMS accelerometer interfaced with an Arduino microcontroller and identify abnormal impact conditions.
2. To determine and report the accident location using GPS and GSM modules by transmitting accident information through SMS to predefined emergency contacts or medical centres, thereby reducing emergency response time.

## PROPOSED SYSTEM

The proposed Vehicle Accident Detection and Reporting System is designed to automatically detect an accident and communicate the accident information to predefined emergency contacts or a treatment centre.

The system uses an Arduino Uno as the main controller and integrates a MEMS accelerometer, GPS module, GSM module, 16×2 LCD, buzzer, DC motor, and regulated power supply.

The MEMS accelerometer continuously monitors vehicle motion and identifies sudden impacts or abnormal changes that may indicate an accident. Once an accident condition is detected, the Arduino processes the sensor data and obtains the exact geographical location using the GPS module.

After determining the accident location, the GSM module transmits an SMS containing the accident details and coordinates to predefined contacts and the centralized treatment centre. The LCD displays the system status, while the buzzer provides an audible warning to attract nearby assistance. The prototype also includes a DC motor representing the vehicle engine, which is switched off during an accident condition to reduce further risk. By combining accident sensing, location tracking, local indication, and wireless reporting, the proposed system provides a practical framework for reducing delays in emergency response and improving vehicle safety.

## BLOCK DIAGRAM

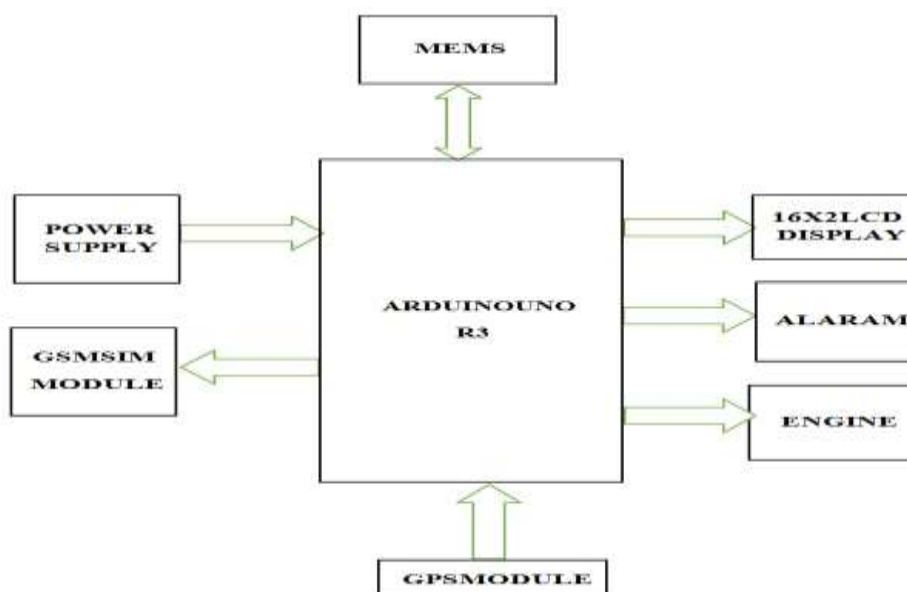


Fig.1Block diagram of Vehicle accident detection and reporting system

Fig. 1 shows the Arduino Uno R3 as the central controller interfaced with the MEMS sensor, GPS module, GSM module, LCD display, alarm, and engine. The system detects accident conditions using the MEMS sensor and uses GPS and GSM modules to determine the location and transmit emergency information.

## CIRCUIT DIAGRAM

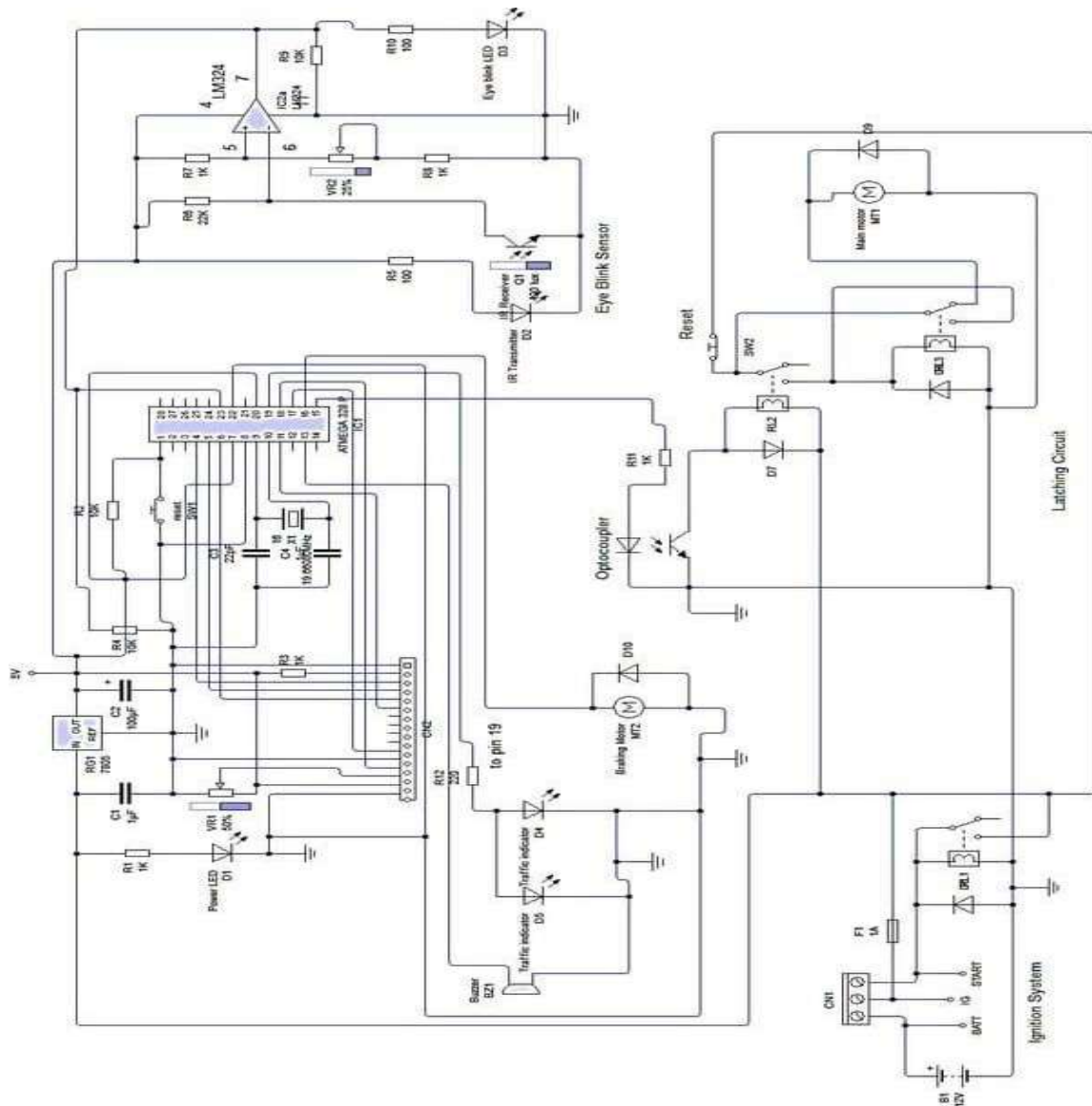


Fig 2 Circuit diagram of Vehicle accident detection and reporting system

Fig. 2 shows the circuit connections of the microcontroller with the power supply, sensors, indicators, relay, motor, and ignition system. The controller processes the input signals and operates the alarm and engine-control circuits according to the detected accident condition.

## METHODOLOGY

The proposed Vehicle Accident Detection and Reporting System is developed by integrating the **Arduino Uno R3**, **MEMS accelerometer**, **GPS module**, **GSM module**, **16×2 LCD**, **buzzer**, and **engine-control unit**. The MEMS accelerometer is interfaced with the Arduino to continuously monitor vehicle movement and detect sudden impacts or abnormal changes in acceleration. The GPS and GSM modules are connected to the controller for location tracking

and wireless communication, while the LCD displays the operating status of the system. The hardware components are supplied through a regulated power supply to ensure stable operation.

The control program is developed using **Embedded C in the Arduino IDE**. During operation, the Arduino continuously monitors the accelerometer values and compares them with predefined threshold levels. When an accident condition is detected, the controller identifies the impact direction, obtains the geographical coordinates from the GPS module, and sends an SMS containing the accident details and location through the GSM module to predefined emergency contacts. Simulated accident conditions are used to test the complete system, and the threshold values are adjusted to distinguish actual impacts from minor vehicle vibrations, thereby reducing false accident alerts.

## RESULTS AND DISCUSSION

The **Fig. 3** shows the developed **Vehicle Accident Detection and Reporting System**, which was successfully implemented and tested under normal and simulated accident conditions. During normal operation, the LCD displays the system status without generating an emergency alert. When right, left, front, and back accident conditions are simulated, the MEMS accelerometer detects abnormal movement and the Arduino identifies the corresponding impact direction. The GPS module determines the accident location, while the GSM module successfully transmits an SMS containing the accident details and location to the predefined contact. The experimental results demonstrate that the proposed system can perform the complete sequence of **accident detection, location identification, local indication, and emergency notification**. The buzzer provides an immediate warning, while the prototype engine is switched off after accident detection to minimize further risk.

During testing, minor vibrations initially caused false triggering, which was reduced by adjusting the accelerometer threshold. GPS signal acquisition was also more reliable in open areas, while stabilization of the power supply improved GSM communication. Overall, the developed prototype demonstrated effective operation for automatic accident detection and reporting.

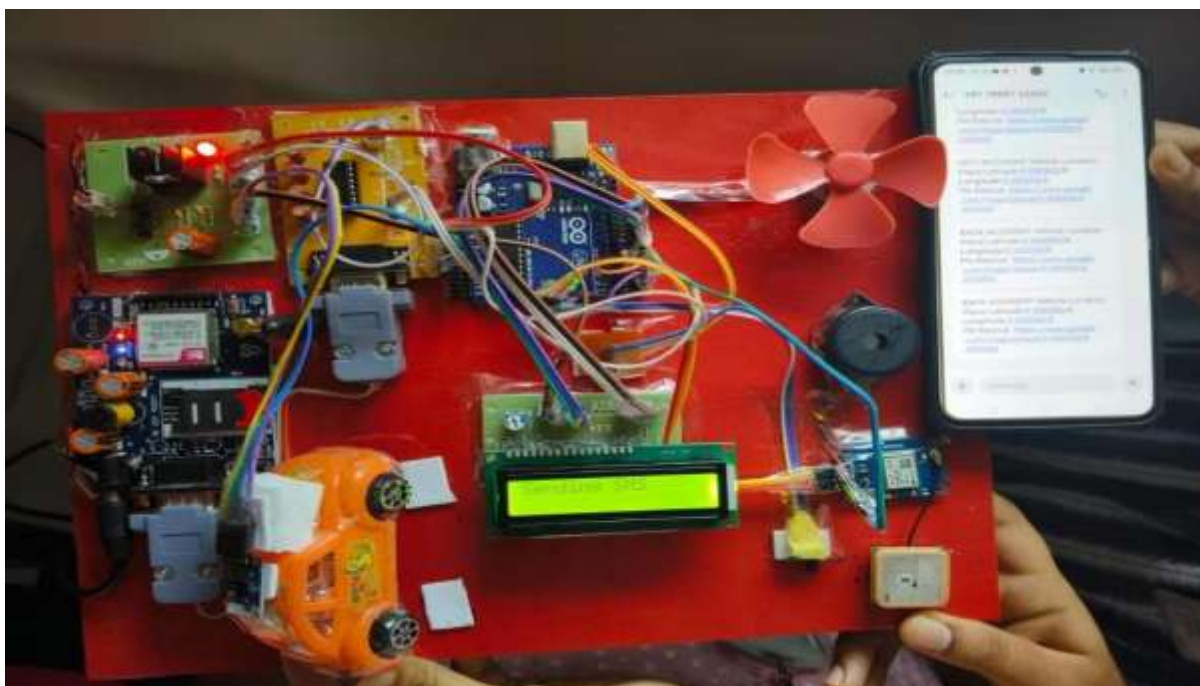


Fig 3 Hardware Setup

## CONCLUSION

The **Vehicle Accident Detection and Reporting System** was successfully developed by integrating Arduino Uno, MEMS accelerometer, GPS, and GSM technologies. The system effectively detects accident conditions, identifies the direction of impact, obtains the accident location, and automatically transmits the relevant information through SMS to predefined emergency contacts. The LCD and buzzer provide local status and warning indications, enabling effective monitoring of the system.

The experimental implementation demonstrates that the proposed system provides a practical and efficient approach for reducing delays in accident reporting and improving emergency response. The developed prototype can serve as a foundation for future intelligent vehicle safety systems with enhanced communication, IoT connectivity, and automated emergency-response capabilities.

## REFERENCES

- [1] S. K. Sulaiman and R. N. Othman, "Vehicle Accident Avoidance System," Department of Computer Science, Bayan University, Erbil, Iraq, 2015.
- [2] P. B. Devkar, V. H. Barkade, and S. S. Kuchekar, "Accident Prevention System," 2017.
- [3] M. G. Vinod and B. Durdi, "Collision Avoidance in Vehicles Using CAN," Jun. 2022.
- [4] N. Kuttukkaran, A. George, and M. Hardas T. P., "Intelligent Accident Detection and Alert System for Emergency Medical Assistance," Department of Electronics and Communication, Cochin University of Science and Technology, Kerala, 2017.