



e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 14, Issue 5, May 2025

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.807

☎ 9940 572 462

☑ 6381 907 438

✉ ijareeie@gmail.com

@ www.ijareeie.com



Smart Accident Alert System

Aditya S. Shinde, Om H. Asekar, Rushikesh B. Sonwate, Sanket D. Sonwane, Shivam T. Sapkal,
Prof. Yawalkar D. P.

Students, Department of Electrical Engineering, Government College of Engineering, Jalgaon, India

Professor, Department of Electrical Engineering, Government College of Engineering, Jalgaon, India

ABSTRACT: Road traffic accidents are major causing thousands of deaths and injuries every year. One of the challenges is the delay in providing emergency services. In many cases, victims are unable to call for help, especially in remote areas, leading to critical delays in medical facility. To overcome it, this paper presents Smart Accident Alert System that can automatically detect accidents and immediately send alerts to emergency contacts and services. The system is built using sensors such as gyroscopes to monitor angular velocity. GPS is used to determine the exact location of the incident by having geographical coordinates and SIM 800 L module technology is employed to send real-time notifications via SMS or mobile applications. This system is low-cost, reliable, making it suitable for both personal and commercial vehicles. It timely communicate between the accident site and emergency responders, improving the chances of survival and reducing the impact of road accidents. The system also supports future enhancements such as AI-powered accident prediction & prevention, health monitoring integration, and big data for urban planning.

KEYWORDS: Road accident, GPS, SIM 800 L, Gyroscope sensor.

I. INTRODUCTION

The smart accident alert system is an innovative technology designed to detect and respond to vehicle accidents in real-time. This system utilizes advanced gyroscope sensor, GPS, SIM 800 L Module and communication technologies (Arduino UNO). The Smart Accident Alert System is a revolutionary technology designed to transform road safety and emergency response. By leveraging advanced sensors, GPS, and communication technologies, this system detects vehicle accidents in real-time and automatically sends alerts to emergency services and concerned parties. With its ability to provide rapid response, accurate location tracking, and timely medical attention, the Smart Accident Alert System has the potential to save lives, reduce injury severity, and enhance overall road safety. As a cutting-edge solution, it is poised to make a significant impact in the realm of vehicle safety and emergency response.

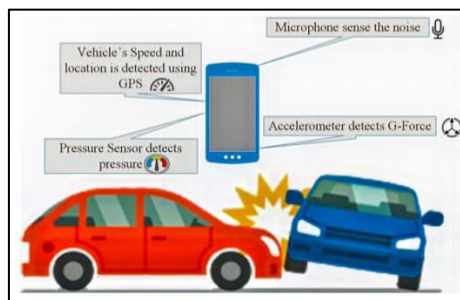


Fig. 1. Introduction of accident detection.

With the rapid growth of vehicle traffic and urbanization, road accidents have become a major public safety, causing loss of life. Issues in such incidents is the delay in informing emergency services, especially when accidents occur in remote or low-traffic areas. Traditional systems having so much delay to report an accident, which may not always be possible if the victims are unconscious. To overcome this issue, the development of a Smart Accident Alert System offers a promising solution by modern technologies such as the Arduino UNO, GPS, and mobile communication networks. This system is designed detect road accidents using sensor data from gyroscopes, which are capable of recognizing sudden changes in angular velocity. Once an accident is detected, the system immediately transmits the exact location and details to emergency contacts or medical services using SMS, ensuring timely assistance. The Smart



Accident Alert System is intended to be a low-cost, that can be easily integrated into both private and commercial vehicles. This paper presents the implementation, and potential benefits of a real-time accident alert system its role in saving lives through faster emergency response and better situational awareness.

II. PROBLEM STATEMENT

Road accidents are leading causes of death and injury today’s world, with millions of lives lost or affected every year due to delayed emergency facility and not having real-time accident detection system. Many times, no one is around to report about accidents or providing emergency facility. In today’s world, most accidents reporting depends on people calling help which is not always possible in remote places. There is a strong need for real-time accident detection system that detects the accident by gyroscope sensor which measures the cars or bikes angular velocity and then finds exact location using GPS, and send alerts to emergency services and any family members without needing someone to call for help. This system should work in real-time, responds quickly and help save lives by getting medical help.

III. WORKING

The smart accident alert system is mainly designed to detect vehicle accidents and notify emergency services. The system functions through a sensor, arduino uno, GPS for location tracking and SIM 800L module. First gyroscope sensor is used to continuously monitor the vehicle angular velocity. These sensors send real-time data to the arduino uno which process the inputs to detect sudden impact or abnormal movements. Once an accident is detected which crosses the threshold values, the system activates the GPS module to require the exact geographical location which having latitude and longitude of an accidents. This information is then passing to the arduino uno which communicate with other device, typically, SIM 800 L modules, which sends an alert message to emergency contacts. Alert contains information of accidents, location coordinates. A backup power source is often including ensuring the system remains operational even if the vehicle’s main power is disrupted during the accidents.

IV. BLOCK DIAGRAM

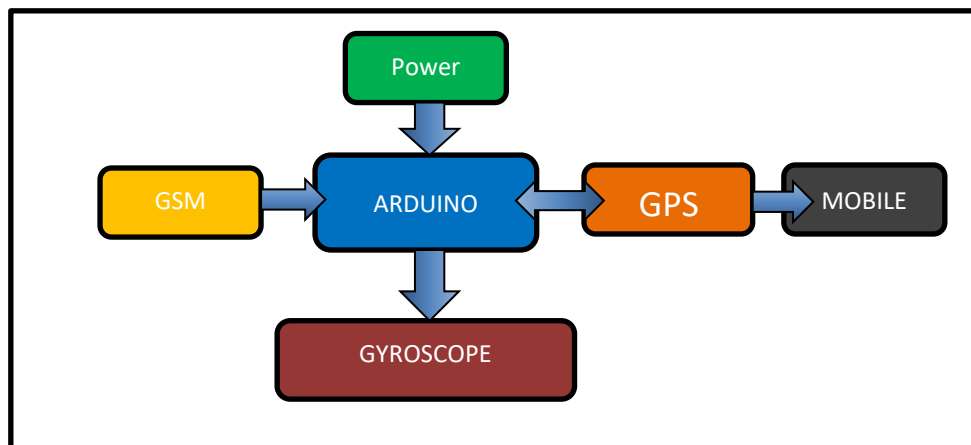


Fig. 4. Block Diagram.

4.1 Power Supply:

The power supply block is responsible for providing the necessary operating voltage and current to all the components in the system. It typically required 3.7 V suitable for the microcontroller and modules, ensuring stable operation throughout the system.



Fig.4.1 Power supply.

4.2 Arduino uno:

The microcontroller acts as the brain of the entire system. It continuously monitors data from connected sensors such as the gyroscope sensor. When the sensor values exceed predefined thresholds indicating a possible accident, the microcontroller processes this input and takes appropriate actions. It then triggers other modules such as the GPS and GSM to collect the location and send an alert message.



Fig 4.2 Arduino UNO.

4.3 Gyroscope Sensor:

The gyroscope sensor measures the vehicle’s angular velocity in multiple axes—typically X, Y, and Z. During normal driving conditions, the angle values remain within a stable range. When a sudden change occurs, such as during a crash or collision, the sensor detects shift. The data is sent to the Arduino, where it is compared with predefined threshold values. If the change exceeds this threshold, it is interpreted as an accident. The gyroscope thus plays a key role in identifying the physical dynamics of the vehicle.

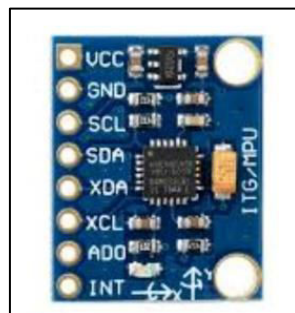


Fig. 4.3 Gyroscope.

4.4 GPS Module:

The GPS module is responsible for determining the geographical location of the vehicle at the time of an accident. When the Arduino detects an accident, it sends a request to the GPS module, which then collects satellite signals and



returns the current latitude and longitude coordinates. The module typically communicates with the Arduino via serial communication (TX and RX pins). The Arduino extracts the relevant location information from the data stream, which is then included in the SMS alert. This allows emergency responders to reach the exact site of the accident quickly.

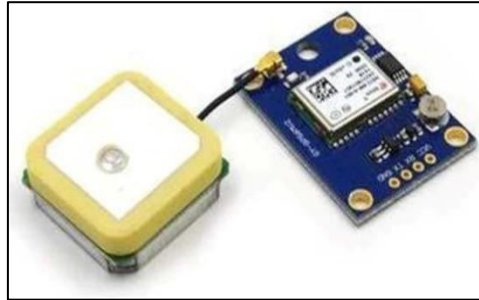


Fig. 4.4 GPS Module.

4.5 SIM 800 L Module:

In the SIM 800 L module is used to send SMS messages over a mobile network. Once the Arduino has confirmed an accident and received the GPS location, it sends a command to the SIM 800 L module to transmit an SMS alert. This message includes a predefined alert text along with the GPS coordinates of the accident. The SIM 800 L module uses to perform communication functions like sending SMS. It requires a SIM card and network coverage to function properly. This component is crucial for remote communication in case of accidents in isolated areas.



Fig 4.4 SIM 800 L Module.

V. IMPLIMENTATION

a) Methodology

The methodology of the proposed Smart Accident Alert System involves the integration of hardware components to accurately detect vehicle accidents and notify emergency contacts. The system is designed using a microcontroller unit, such as an Arduino Uno to serve as a central processor. It is connected with MPU6050 sensor module gyroscope to detect sudden changes in angular velocity and orientation indicative of a collision. This sensor values are continuously monitored and compared against threshold values. When these thresholds are crosses, the system detect an accident. A GPS module (such as Neo-6M) is then activated for real-time location coordinates of the accident. Once a valid GPS location is obtained, the latitude and longitude data, emergency alert message will be send. This message is then sent using a GSM module (e.g., SIM800L) emergency contact numbers via SMS. In more advanced implementations, alerts can also be directed to nearby hospitals, emergency services, or cloud-based platforms for real-time monitoring. The system is powered by a 3.7 V power source with a battery backup to ensure uninterrupted operation. To validate the system, multiple simulated accident scenarios were conducted in a controlled environment to fine-tune the detection thresholds and assess the reliability of GPS and GSM communication. The methodology ensures rapid and accurate accident detection, ultimately aiming to reduce emergency response time and improve survival chances for accident victims.



b) Module

The prototype of smart accident alert system which is embedded with Arduino UNO, Power Supply, SIM800L Module, GPS, MPU6050 Gyroscope.

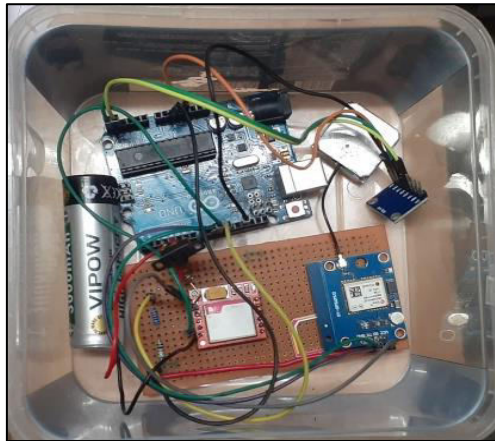


Fig.5 Prototype of smart accident alert system.

VI. RESULTS

The smart accident alert system detected accidents due to human errors, external factors, vehicle related causes and environmental factors with the help of MPU6050 gyroscope. Then SMS will be sent from SIM 800L module with geographical location consists of latitude and longitudes with the help of GPS module.

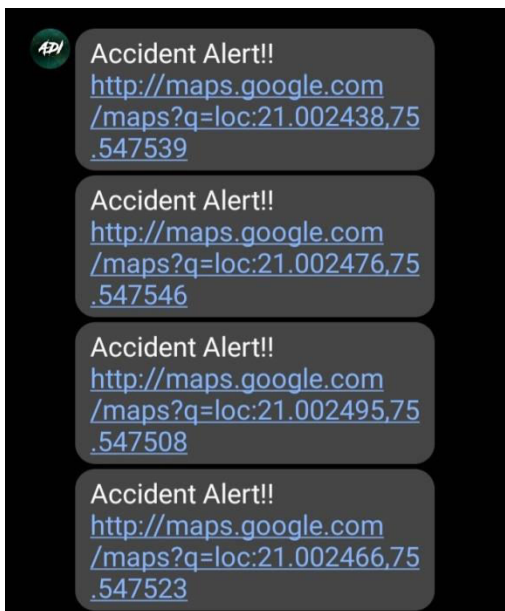


Fig. 6.1 GPS link for location

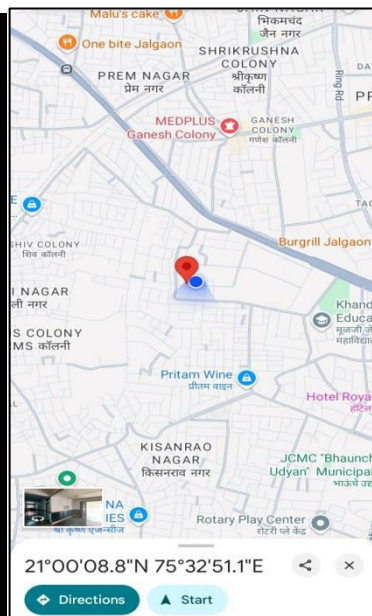


Fig. 6.2 Exact location on the Google maps

VII. CONCLUSION

Nowadays, more accidents take place in various cities causes' death by accidents. An accident will happen where emergency facilities will not there, therefore, smart accident alert system overcome this situation. It has arduino uno which having processing data and communicating with MPU 6050 gyroscope, SIM 800L module, GPS module to ensure a quick and efficient response. MPU 6050 gyroscope measures the angular velocity due to that accident will be detected. SIM 800L module sent SMS to the location where emergency facilities will dispatches. GPS module sent real



time geographical information automatically having latitude and longitudes regarding accidents. The result show that smart accident alert system crosses magnitude of angular velocity which will be set at gyroscope SMS will be sent with real-time location. This system made more user-friendly and reliable. This system will be highly beneficial for the public transportations and personal vehicles.

VIII. ADVANTAGES

- 1.Faster Emergency Response – Enables quicker assistance through instant accident alerts.
- 2.Real-time Location Tracking – Provides accurate crash location using GPS for swift help.
- 3.Automatic Detection via Gyroscope – Detects accidents autonomously using motion sensors.
- 4.Immediate Notification via SIM800L Module – Sends alerts to emergency contacts instantly through GSM.
- 5.Reduces Human Error – Minimizes reliance on manual reporting during critical incidents.
- 6.Enhances Road Safety – Increases overall safety by enabling quicker responses and awareness.
- 7.Vehicle Health Monitoring Integration – Combines accident alerts with vehicle diagnostics.
- 8.Saves Time in the “Golden Hour” – Speeds up critical response time to potentially save lives.
- 9.Useful for Insurance & Legal Claims – Provides data and evidence to support post-accident processes.
- 10.Enhanced Driver Safety – Offers additional protection and monitoring for the driver.
- 11.Data Collection & Analytics – Gathers valuable data for safety analysis and improvements.
- 12.Improved Hospital Preparedness – Notifies hospitals in advance for better trauma readiness.
- 13.Support for Elderly or Disabled Drivers – Offers vital help to vulnerable individuals in emergencies.
- 14.Low Power & Cost-Efficient – Operates on 3.7V supply, making it energy-saving and affordable.
- 15.Vehicle-to-Everything (V2X) Communication – Connects with infrastructure and other vehicles for smarter response.
- 16.Promotes Safer Driving Culture – Encourages responsible driving through monitoring and alerts.
17. Useful for fleet management & insurance.
18. Works in remote or low-traffic areas.

IX. DISADVANTAGES

1. High initial cost due to installation and integration with vehicles or smart phones can be expensive.
2. Maintenance issues due to periodic maintenance, software updates.

X. APPLICATIONS

- 1.Personal Vehicles – Privately owned cars used for individual or family transportation.
- 2.Fleet Management and Logistics – Coordinated operation and tracking of commercial vehicle fleets for goods and services.
- 3.Public Transportation Systems – Mass transit services like buses, trains, and subways for public mobility.
- 4.Emergency Services & Police Vehicles – Specialized vehicles for rapid response, law enforcement, and public safety.
- 5.School Buses – Vehicles dedicated to safely transporting students to and from schools.
- 6.Ambulance System – Emergency medical transport equipped for critical patient care and hospital transfers.
- 7.Smart Cities & Intelligent Transportation Systems – Integrated urban transport networks using technology for efficiency and safety.
- 8.Rural and Remote Area Safety – Transport solutions aimed at improving access and safety in underserved areas.
- 9.Military and Defence System – Tactical vehicles designed for defense operations, logistics, and combat scenarios.
- 10.Industrial and Mining Vehicles – Heavy-duty vehicles used for construction, extraction, and industrial operations.
- 11.Insurance Sector – Use of vehicle data to assess risk, manage claims, and develop usage-based policies.
- 12.Driving School – Institutions using vehicles and simulators to train new drivers in road safety and skills.
- 13.Traffic Management Centers – Facilities that monitor and control urban traffic flow through real-time data systems.

XI. SCOPE OF THE FUTURE WORK

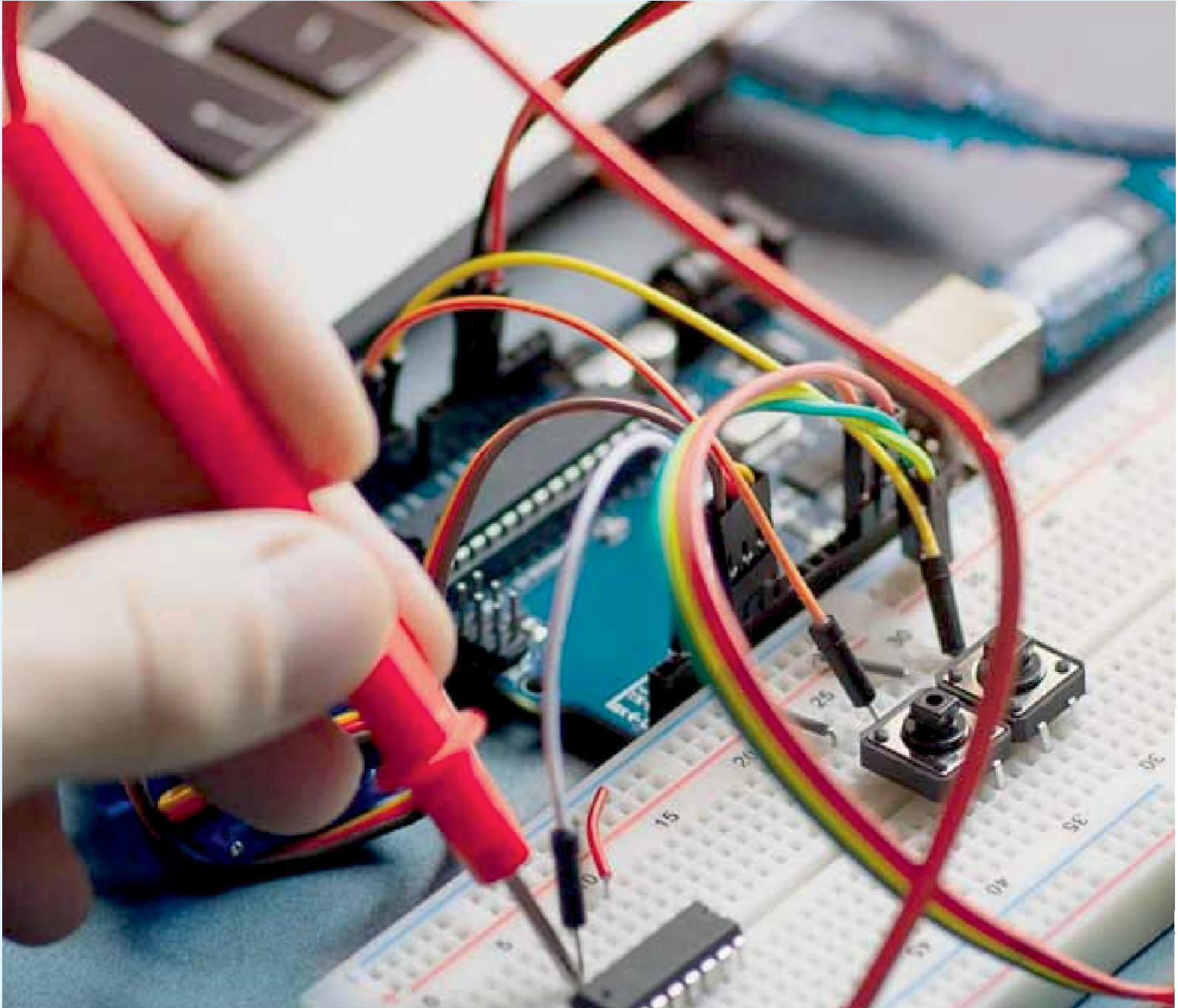
- 1 AI-powered Accident Prediction & Prevention – Uses artificial intelligence to forecast and avoid potential road accidents.
2. Health Monitoring Integration – Embeds biometric sensors in vehicles to track driver health and detect emergencies.
- 3.Big Data for Urban Planning – Analyzes large-scale mobility data to design smarter, more efficient city infrastructure.



4.5G and Beyond for Ultra-fast Communication – Enables real-time, high-speed connectivity for connected and autonomous vehicles.

REFERENCES

- [1] T Kalyani, S Monika, B Naresh, Mahendra Vucha, Accident Detection and Alert System, IJITEE, March 2019 (Base paper).
- [2] Parag Parmar, Ashok M. Sapkal, Real time detection and reporting of vehicle collision, IEEE, 2017.
- [3] Md. Syedul Amin, Jubayer Jalil, M.B.I. Reaz, Accident Detection and Reporting System using GPS, GPRS and GSM Technology, IEEE, 2012.
- [4] Gowshika B, Madhu Mitha, G. Jayashree, Vehicle accident detection system using GPS, GSM modem, IRJET, 2019.
- [5] Sayanee Nanda, Harshada Joshi, Smitha Khairnar, An IOT Based Smart System for Accident Prevention and Detection, IEEE, 2018.
- [6] Norsuzila Yaacob, Ainnur Eiza Azhar, Azita Laily Yusof, Suzi Seroja Sarnin, Darmawaty Mohd Ali and Ammar Anuar, Real Time Wireless Accident Tracker using Mobile Phone, IEEE, 2017.
- [7] S. Sonika, Dr. K. Sathyasekhar, S. Jaishree, Intelligent accident identification system using GPS, GSM modem, DARCCE, 2014.
- [8] Dhruvesh H. Patel, Parth Sadatiya, Dhruvbhai K. Patel, Prasann Barot, IoT based Obligatory usage of Safety Equipment for Alcohol and Accident Detection, IEEE, 2019.
- [9] Ajith Kumar. A, Jaganivasan. V, Sathish. T, Mohanram. S, Accident detection and alert system using GPS & GSM, IJOPAAM, 2018.



INNO  SPACE
SJIF Scientific Journal Impact Factor

 **doi**[®]
cross **ref**

 **INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA**


**निस्कैयर
NISCAIR**

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

 **9940 572 462**  **6381 907 438**  **ijareeie@gmail.com**



www.ijareeie.com

Scan to save the contact details