



**AUTOMATIC REAL TIME ACCIDENT ALERT SYSTEM**

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**ABSTRACT**

The Automatic Real-Time Accident Alert System is an intelligent vehicle safety solution designed to detect accidents instantly and notify emergency contacts, hospitals, and authorities in real time. The system uses a combination of vibration sensors, gyroscopic sensors, GPS modules, and IoT devices to continuously monitor the vehicle's condition. When an accident occurs, the sensors detect abnormal impacts, sudden tilts, or rapid deceleration, and the data is processed using feature extraction, classification, and object detection algorithms to confirm the event. Once confirmed, the system automatically generates an alert containing the type of accident, vehicle status, and exact GPS location, which is transmitted immediately to emergency responders and designated contacts. The system also maintains a database of all events for logging, analysis, and future performance improvement. This project improves road safety by reducing the response time after accidents, minimizing damage, and potentially saving lives.

**INTRODUCTION**

The Automatic Real Accident Alert System is an advanced safety technology designed to detect road accidents and immediately send alerts to emergency services and family members. Road accidents are one of the major causes of injuries and deaths worldwide, mainly because emergency help often arrives late. This system aims to reduce the delay in providing medical assistance by automatically detecting accidents and notifying the concerned authorities. This system works by integrating different technologies such as sensors, GPS modules, and communication devices. Sensors like vibration sensors and gyroscopic sensors detect sudden impact or abnormal movement of the vehicle. When such a situation occurs, the system

identifies it as a possible accident and activates the alert mechanism. After detecting an accident, the system collects the exact location of the vehicle using the GPS module. This location information is very important because it helps emergency responders quickly identify where the accident has occurred. The accurate location ensures that help can reach the accident site without wasting time.

Once the location is identified, the system automatically sends alert messages to pre-registered contacts such as family members, nearby hospitals, and police stations. The alert message usually includes details like the accident notification and the GPS location of the vehicle.

The Automatic Real Accident Alert System also helps in reducing human intervention during emergencies. In many accident situations, the victim may be unconscious or unable to call for help. In such cases, the automated alert system plays a crucial role by sending notifications without depending on the victim.

Another important advantage of this system is that it improves road safety by using modern technologies such as IoT and communication networks. These technologies allow real-time monitoring and quick data transmission, which makes the accident detection and alert process faster and more reliable.

The Automatic Real Accident Alert System is an innovative solution that helps save lives by reducing the time taken to respond to road accidents. By automatically detecting accidents and sending instant alerts with location details, the system ensures that emergency services can reach the accident spot quickly and provide immediate medical assistance.

The Automatic Real Accident Alert System can also store accident data for future analysis. This information can help authorities understand accident patterns, dangerous road areas, and common causes of accidents. By analyzing this data, preventive measures can be implemented to improve road safety.

The system is designed to be cost-effective and easy to integrate into vehicles. With the help of components such as GPS modules, communication modules, and sensors, the system can be installed in many types of vehicles including cars, buses, and bikes. This makes the technology accessible and useful for a wide range of users.

## **1. LITERATURE REVIEW**

The Automatic Real-Time Accident Alert System is built on the integration of sensors, IoT devices, GPS modules, and AI-based algorithms to enhance vehicle safety and provide immediate accident alerts. A review of existing literature shows that traffic accidents remain a major cause of fatalities globally, and traditional emergency response systems often face delays due to lack of real-time information. Several researchers have proposed systems using mobile GPS tracking, IoT-based sensors, and GSM communication to alert authorities, but many lacked accuracy in accident detection or faced delays in transmitting alerts.

Studies on sensor-based monitoring highlight that vibration and gyroscopic sensors are highly effective in detecting sudden impacts, tilts, or abnormal vehicle movements. Research on GPS integration emphasizes the importance of providing precise location data to minimize emergency response time. Moreover, the adoption of AI and computer vision techniques, including models like YOLO, Faster R-CNN, and SSD, has been shown to significantly improve the detection and classification of accidents by analyzing real-time sensor and video data.

Recent literature also focuses on the integration of IoT and cloud-based systems, allowing real-time monitoring, data logging, and analytics. These advancements ensure that accident alert systems are not only reactive but also capable of storing historical data for analysis, predictive modeling, and improving system efficiency. However, most existing systems still face challenges like false alarms, high dependency on manual intervention, or limited real-time processing capabilities.

The proposed system addresses these gaps by combining multi-sensor inputs, AI-based accident detection, real-time alert transmission, and database logging. This ensures accurate, fast, and reliable accident detection, with instant notification to emergency contacts and authorities, thus significantly improving road safety and emergency response efficiency.

The development of an Automatic Real-Time Accident Alert System is based on extensive research in sensor technology, IoT, GPS tracking, and AI-based accident detection. Previous studies have shown that traditional emergency response systems often face delays due to reliance on manual reporting, which increases the risk of fatalities and vehicle damage.

Research on IoT and cloud-based communication highlights the importance of automatic alert transmission, enabling real-time notifications to hospitals, police, and family members.

AI and object detection models like YOLO, Faster R-CNN, and SSD improve accident verification by analyzing sensor data and differentiating between actual accidents and minor bumps, reducing false alarms. Databases are also critical in storing accident records, sensor readings, and alert histories, which can be used for system analysis, predictive modeling, and future improvements.

The proposed system addresses these gaps by combining multi-sensor inputs, AI-based accident detection, real-time GPS tracking, IoT communication, and database management. This integration ensures accurate, reliable, and timely accident detection,

## **2. EXISTING SYSTEM**

In the current scenario, most accident alert or vehicle monitoring systems rely on manual reporting, basic GPS tracking, or single-sensor detection, which often results in delayed responses and limited accuracy. Traditional systems usually require the driver or a witness to notify emergency services after an accident occurs, which can waste critical time and lead to serious injuries or property damage. Some modern systems incorporate GPS or GSM modules to send alerts, but they often depend on mobile networks, which may fail in remote areas or during network congestion. Existing vehicle safety systems may use only single sensors, such as vibration sensors or accelerometers, to detect impacts, but these systems cannot reliably distinguish between actual accidents and minor bumps or uneven road conditions. As a result, false alarms are common, and emergency resources may be misused. Additionally, many of these systems lack integration with databases, AI-based accident verification, or IoT-enabled communication, which limits their ability to provide accurate, real-time monitoring and alerts. Overall, the existing systems are partially automated but still have significant drawbacks, such as slow response times, high dependency on manual intervention, low accuracy in accident detection, and inadequate data storage for analysis or future improvements. These limitations highlight the need for a more intelligent, integrated, and real-time accident alert system that can overcome these challenges and provide faster, more reliable emergency notifications.

### **Disadvantages**

The existing vehicle accident alert systems, though useful to some extent, have several significant disadvantages that limit their effectiveness in real-time accident detection and emergency response. One major drawback is delayed accident reporting, as most systems rely on manual notification or single-sensor triggers, which can waste critical time during emergencies. Many systems also face low accuracy in accident detection, as they often cannot distinguish between minor bumps, potholes, or actual collisions, leading to frequent false alarms. Another disadvantage is limited integration and automation. Existing systems generally do not combine multiple sensors, GPS tracking, AI-based analysis, and IoT communication, which reduces their reliability and makes them dependent on network availability.

Data management is also weak, as most systems do not store accident events, sensor readings, or alerts for future analysis, limiting opportunities for system improvement and predictive accident prevention.

Furthermore, these systems often have poor user interfaces, making it difficult for users to monitor vehicle status, configure emergency contacts, or track alerts effectively. In remote areas or during network failure, many systems fail to send timely notifications,

Overall, the disadvantages of existing systems highlight the need for a comprehensive, automated, and intelligent accident alert system that ensures real-time, accurate detection and rapid emergency response while maintaining reliability and user-friendliness.

## **PROPOSED METHODOLOGY**

The Proposed Methodology for the Automatic Real-Time Accident Alert System focuses on designing an intelligent, fully automated system capable of detecting accidents accurately and sending alerts instantly. The system continuously monitors the vehicle using vibration sensors and gyroscopic sensors to detect sudden impacts, tilts, or abnormal movements. These sensor inputs are pre-processed to remove noise and irrelevant data. Once an accident is confirmed, the system automatically generates a detailed alert containing the type of accident, severity, vehicle condition, and exact GPS location.

### **1. Data Collection**

Data collection is a critical part of the Automatic Real-Time Accident Alert System, as it provides the raw information needed for accurate accident detection and analysis. In this system, data is gathered from multiple sources, primarily sensors, GPS modules, and IoT devices installed in the vehicle.

### **2. Data Preprocessing**

Data Preprocessing is a crucial step in the Automatic Real-Time Accident Alert System because it prepares the raw data collected from sensors, GPS modules, and IoT devices for accurate analysis and accident detection. Raw sensor data often contains noise, errors, or irrelevant fluctuations caused by road bumps

### **3. Model Selection and Training**

Model Selection and Training is a vital stage in the Automatic Real-Time Accident Alert System, as it determines how accurately the system can detect and classify accidents in real time. This step involves choosing the most suitable machine learning or deep learning models that can process the preprocessed sensor data, GPS information, and other inputs to identify accidents while minimizing false alarms

### **4. Feature Extraction**

Feature Extraction is a crucial step in the Automatic Real-Time Accident Alert System, as it converts the preprocessed sensor and GPS data into meaningful information that can be used by the detection and classification models.

### 5. Object Detection and Localization

Object Detection and Localization is a key component of the Automatic Real-Time Accident Alert System, as it allows the system to identify and track objects around the vehicle and determine the precise location of any accident event

### 6. Result Visualization

The final output is displayed to the user by highlighting detected objects with bounding boxes and labels on the screen. This makes it easier for users to understand which objects are present in the image.

### Process of the Proposed Systems

**Image/Video Acquisition** The system starts by acquiring input data. This can be in the form of images from a dataset or live video streams captured using cameras. High-quality input data ensures better feature extraction and detection accuracy.

**Data Preprocessing** Before feeding the images into the model, preprocessing is performed to improve consistency and quality. Common preprocessing steps include:

- Resizing images to a uniform dimension.
- Normalization to scale pixel values.
- Noise reduction to remove unwanted artifacts.
- Data augmentation (rotation, flipping, scaling) to increase dataset diversity, especially for underrepresented classes.

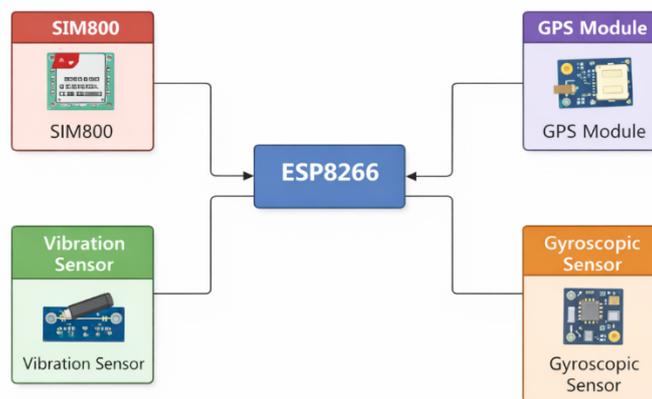


Fig 1: Automated object detection sensor network diagram

### 3. CONCLUSION

The Automatic Real-Time Accident Alert System is a highly efficient and intelligent solution designed to enhance vehicle safety and reduce response time during accidents. By integrating vibration sensors, gyroscopic sensors, GPS modules, and advanced processing algorithms, the system can detect accidents in real time and automatically send alerts to emergency contacts,

hospitals, police stations, and family members. This rapid response ensures that help reaches the accident site quickly, potentially saving lives and reducing damage. The system combines real-time monitoring, feature extraction, object detection, and classification to distinguish between actual accidents and minor bumps or false events, ensuring high accuracy and reliability. With a well-structured database and communication system, all accident events and alerts are recorded for analysis and future improvements. The inclusion of a user-friendly monitoring application allows operators to track vehicle status and configure alerts easily.

Through careful system design, testing, and implementation, the project demonstrates a practical and dependable approach to vehicle safety. It not only improves emergency response times but also provides a framework for future enhancements, such as integration with smart city traffic management or advanced AI models for predictive accident prevention.

#### **4. FUTURE ENHANCEMENT**

The Automatic Real-Time Accident Alert System can be further improved with several future enhancements to increase its efficiency, accuracy, and usefulness. One possible enhancement is integration with advanced AI and machine learning models, which can predict potential accidents by analyzing driving patterns and vehicle behavior, allowing for preventive measures before an accident occurs. Another improvement is cloud-based data management, enabling real-time storage and access of accident data across multiple devices, which can support authorities and hospitals with faster decision-making. The system can also include vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication, allowing cars to alert nearby vehicles about sudden braking, accidents, or hazardous conditions on the road. Adding advanced sensors and cameras with night vision, infrared, or environmental monitoring capabilities can help detect accidents more accurately under all conditions, including low visibility or extreme weather. The mobile application and dashboard can also be upgraded to provide more interactive features such as live tracking, accident severity alerts, and historical analytics for drivers. Finally, integration with smart city systems or traffic management platforms can help emergency services respond faster by optimizing routes, reducing traffic delays, and improving overall road safety. These enhancements will make the system more intelligent, proactive, and capable of saving more lives while providing advanced safety features for vehicles and drivers.

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