

ABSTRACT

Accident detection and emergency response systems play a crucial role in reducing fatalities and ensuring timely medical intervention. This project presents an intelligent accident detection system using an accelerometer-based impact sensor, heart rate monitoring, and GPS-based location tracking. The system integrates an ADXL345 accelerometer to detect sudden impacts, triggering an alert mechanism upon exceeding a predefined threshold. A MAX30102 pulse oximeter sensor continuously monitors heart rate and SpO₂ levels to assess the victim's physiological condition post-accident.

Upon detecting an accident, an alert is activated through a buzzer for 20 seconds, allowing the user to cancel a false alarm via a manual switch. If no cancellation is detected, the system proceeds to collect heart rate and SpO₂ data. If abnormal physiological conditions are detected, the system fetches real-time GPS coordinates from a GPS module and transmits an emergency alert via an embedded GSM module. The system automatically places an emergency call and sends an SMS containing the victim's location and vital health parameters to predefined contacts, facilitating rapid assistance.

The proposed system enhances traditional accident detection mechanisms by integrating physiological monitoring to differentiate between critical and non-critical incidents. This reduces false alarms while ensuring immediate response in life-threatening situations. The system is designed for standalone operation, making it a practical and reliable solution for real-time accident detection and emergency communication. Experimental validation demonstrates its effectiveness in accurately detecting accidents and transmitting critical information for prompt medical intervention.