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# Automatic Vehicle Accident Detection and Alerting System

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**Abstract:**

This proposal outlines a proactive approach to mitigating the devastating impact of vehicle accidents by leveraging GPS technology and real-time communication systems. By integrating a GPS receiverwith an Arduino Nano board, the system continuously monitors the vehicle's speed. When a significant decrease in speed is detected, indicating a potentialaccident, the system triggers an alert mechanism.

The alert includes crucial information such as the accident location obtained from the GPS, along with the time of the incident and the vehicle's speed at the time of impact. This data is transmitted via the GSM networkto an Alert Service Center, enabling emergency responders to swiftly reach the scene.

This system addresses the pressing need for timely intervention in accidents, which are often caused by factors such as speeding, impaired driving, distractions,stress, and technology usage. By automating thedetection and notification process, precious time is saved, increasing the likelihood of saving lives and minimizing the severity of injuries

**Introduction:**

The advancement of transportation systems has propelled human civilization forward, distinguishing us from other creatures on Earth. Among these systems, automobiles play a crucial role in our daily lives, facilitating travel to work, maintaining connections with loved ones, and transporting goods. However, alongside its convenience, the automobile carries inherent risks, with accidents posing a significant threat to life and well-being.

Speed stands out as a fundamental risk factor in driving, influencing both the likelihood and severity of accidents. Despite widespread efforts by governmental and non- governmental organizations to promote safe driving practices, accidents continue to occur with alarming frequency. The persistent occurrence of accidents underscores the critical importance of timely intervention by emergency services.

Research, such as the study conducted by Virtanen et al., highlights the potential for saving lives through prompt emergency response. According to their findings, a notable percentage of fatalities could have been prevented if emergency services had arrived at the accident scene promptly. This underscores the urgent need for an efficient automatic accident detection system capable of swiftly notifying emergency services with accurate accident location data. Proportional to the square of speed. Consequently, the likelihood of avoiding a collision

**Problem Statement:**

The existing gap between current systems and the ideal system lies in the delay inherent in human intervention following an accident. An automated system that immediately provides the latitude and longitude of the accident site upon occurrence could significantly enhance emergency response times, thereby saving more lives.

As the population grows, so does the usage of vehicles, leading to increased traffic congestion and, consequently, a rise in accidents. This heightened risk underscores the critical need for swift ambulance arrival at accident scenes and prompt transportation of victims to hospitals. Time is of the essence in such situations, and any delays can result in loss of life or exacerbate injuries.

**Objectives of Project:**

The primary objective is to prevent accidents by continuously monitoring changes in the vehicle's speed, while also utilizing the accelerometer to detect falls or sudden impacts. The Arduino serves as the central control unit responsible for detecting and alerting in theevent of an accident. It gathers data from various components such as the accelerometer, GPS, and GSM modules, and processes this information to generateappropriate outputs.

By integrating these components and leveraging real- time communication capabilities, the system ensures that emergency services are promptly notified in the event of an accident. This swift response can significantly increase the chances of saving lives by enabling rescue services to reach the scene quickly and provide necessary assistance. Ultimately, the goal is to leverage technology to enhance road safety and minimize the impact of

accidents on individuals and communities.

**Literature Review**

**Accident Detection And Reporting System Md Syedual, Ieee, 2012**

The paper proposes utilizing the GPS receiver's capabilities to monitor vehicle speed, facilitating accident detection based on speed variations. This information, along with the accident location and time obtained from GPS data processed by the Arduino Nano, is transmitted via the GSM network to the Alert Service Centre.An essential consideration in accident prevention is the relationship between speed and braking distance. At higher speeds, the distance required to come to a complete stop increases, as braking distance is diminishes as speed rises.

**Vehicle Accident Detection System Gowshika B, Irjet, 2019**

This paper proposes utilizing an accelerometer sensor to detect accidents by measuring the voltage generated upon collision. The Arduino Nano processes GPS data to determine the accident's location and time, which is then transmitted via the GSM network to the Alert Service Centre. The GPS data provides the latitude and longitude coordinates, enabling precise location identification. These coordinates are sent as a message to the rescue team through a GSM module.

**Intelligent Accident Identification System Sayanee Nanda, Ieee, 2018**

The system's primary goal is to swiftly detect and reportaccidents in real-time by leveraging a comprehensive array of technologies. It employs Global Positioning System (GPS) for precise location tracking and Global System for Mobile Communications (GSM) modem for efficient communication. Sensors are strategically positioned to detect the impact of accidents and trigger the system into action.

**IOT Based Smart System for Accident Prevention and Detection Shadaman Sakib, Ieee, 2016**

Currently, the lack of means to detect accident locations promptly results in tragic outcomes, with individuals losing their lives due to delays in emergency response. To address this issue, ongoing research is focusing on developing methods to track vehicle positions even in dark or remote areas where network signals may beunavailable.

This project utilizes GPS technology for real-time vehicle tracking, ensuring accurate location data regardless of environmental conditions. Global System for Mobile Communications (GSM) is employed to transmit messages, enabling communication even in areas with limited network coverage. Additionally, an ARM controller is utilized to store mobile numbers in the EEPROM and send messages to designated recipients when an accident is detected.

**Accident Detection And Reporting System Parag Parmar, Ieee, 2017**

The paper proposes a comprehensive approach to accident detection and response by utilizing both accelerometer and gyroscope data. These sensors provide crucial information about the orientation angle and orientation of the vehicle, facilitating accurate accident detection. Upon detection, the system leverages GPS data processed by a Microcontroller to determine the accident's location, which is then transmitted via the GSM network to the nearest hospital and family members of the individuals involved.

**Implication:**

An automatic vehicle accident detection and alerting system holds significant implications for enhancing road safety and emergency response. Here are some key implications:

1. **Improved Emergency Response Times**: By automatically detecting accidents and immediately alerting emergency services, the system can significantly reduce response times. This swift response is crucial for providing timely medical assistance to accident victims, potentially saving lives.
2. **Enhanced Accuracy in Accident Detection**: is Utilizing sensors such as accelerometers, gyroscopes, and GPS trackers enables the system to accurately detect accidents based on factors like impact force, orientation angle, and location. This precision helps minimize false alarms and ensures that emergency resources are deployed where they are needed most.
3. **Reduced Human Error:** Automatic accident detection systems rely on technology rather than human intervention, reducing the risk of errors or delays in reporting accidents. This ensures that emergency services are notified promptly, regardless of the time of day or environmental conditions.
4. **Real-time Communication:** By leveraging GSM or other communication networks, the system can quickly relay accident information to relevant stakeholders, including emergency services, hospitals, and family members of the individuals involved. This real-time communication facilitates coordinated response efforts and enables informed decision-making.
5. **Enhanced Road Safety:** The presence of automatic accident detection systems can act as a deterrent to reckless driving behavior. Knowing that accidents will be swiftly detected and emergency services alerted may encourage drivers to exercise greater caution on the road, ultimately contributing to overall road safety.
6. **Data-driven Insights:** Automatic accident detection systems generate valuable data on accident occurrences, locations, and severity. Analyzing this data can provide insights into accident patterns, contributing to the development of targeted

interventions and road safety initiatives.

**7. Integration with Smar Infra structure:** Automatic accident detection systems can be integrated with existing smart infrastructure, such as intelligent traffic management systems or connected vehicle networks. This integration enhances overall transportation efficiency and safety by enabling seamless communication and response coordination across different components of the transportation ecosystem.

**Results:**

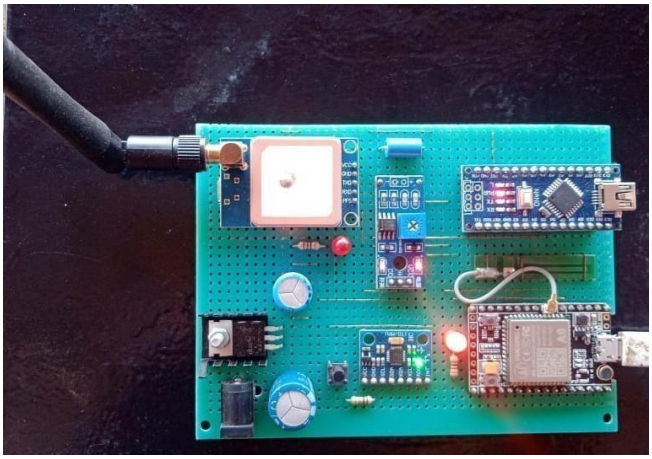


**Fig 7.1 Hardware Module**

An automatic vehicle accident detection and alert system relies on hardware modules like accelerometers, gyroscopes, and GPS trackers installed within vehicles. These modules continuously monitor vehicle movements and can detect abrupt changes in speed, direction, or orientation, which may indicate an accident. Once such an event is detected, the system triggers alerts to emergency services or designated contacts, furnishing them with the vehicle's precise location and pertinentdetails for a prompt response.

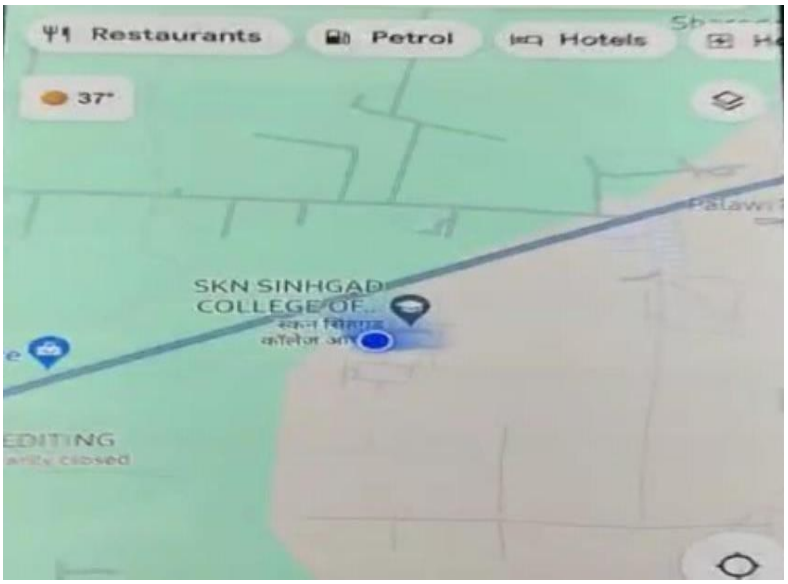
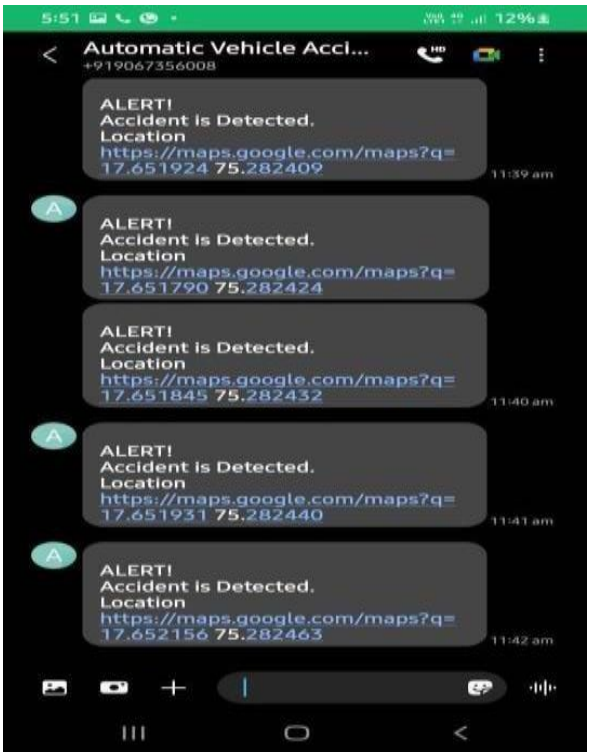
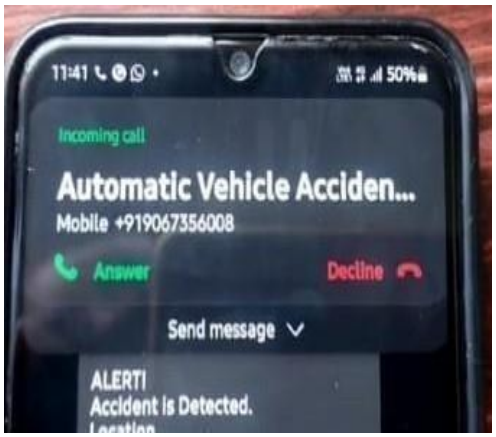



**Fig . Location of the accidentsent via Google Map**

The automatic vehicle accident detection and alert system incorporates a cloud-based functionality to determine the nearest hospital following an accident. This cloud-based service communicates with a web- based application developed using ASP.NET MVC 4. The application serves as an interface for hospitals to assess the severity of accidents and respond accordingly.




**Message & call received by thespecified phone number**




**Conclusion:**

A system designed to detect accidents has been developed, focusing on both alerting and detection aspects. It functions by retrieving precise latitude and longitude coordinates of the vehicle involved in an accident and promptly relaying this information to the nearest emergency service provider. Arduino serves as a key component in transmitting messages to various devices within the system. The accelerometer continuously monitors the direction of the accident, while the gyroscope aids in identifying vehicle rollovers.Once an accident is detected, relevant information is transmitted to registered contacts via a GSM module. Utilizing GPS technology, the system is capable of sending location data through a tracking system, thereby providing comprehensive geographical coordinates of the accident area. This integration of sensors, Arduino, GSM, and GPS technologies enables the system to effectively detect accidents and promptly alert emergency services, contributing to enhanced road safety and timely assistance for accident victims.

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