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# Accident Detection System Using Arduino

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**ABSTRACT**: Speed is one of the basic reasons for vehicle accident. Many lives could have been saved if emergency service could get accident information and reach in time. Nowadays, GPS has become an integral part of a vehicle system. This paper proposes to utilize the capability of a GPS receiver to monitor speed of a vehicle and detect accident basing on monitored speed and send accident location to an Alert Service Center. The GPS will monitor speed of a vehicle and compare with the previous speed in every second through a Microcontroller Unit. Whenever the speed will be below the specified speed, it will assume that an accident has occurred. The system will then send the accident location acquired from the GPS along with the time and the speed by utilizing the GSM network. This will help to reach the rescue service in time and save the valuable human life

**KEYWORDS**: Accident detection; GPS tracker; GSM Module; Microcontroller Unit

## I. INTRODUCTION

Despite many efforts taken by different governmental and non-governmental organizations all around the world by various programs to aware against careless driving, yet accidents are taking place every now and then. However, many lives could have been saved if the emergency service could get the crash information in time. A study by Virtanen et al. shows that 4.6% of the fatalities in accidents could have been prevented only in Finland if the emergency services could be provided at the place of accident at the proper time .As such, an efficient automatic accident detection with an automatic notification to the emergency service with the accident The objective of our project is to prevent fatal situation for lack of emergency facilities when an accident occurs. Using this system, if anyone faces an accident, his or her close relatives and nearby help centre will get a notification so that they can immediately come to aid and help them as our system provides the exact location of the accident spot

To reduce the accidental mortality rate, a cost-effective automatic accident detection system is proposed. This system automatically detects crashes and sends notifications via Short Message Service (SMS) and email to emergency services and designated family members, providing the precise location of the incident. The detection is based on two parameters: acceleration/deceleration and the vehicle's tilt.If the vehicle's speed exceeds the predefined maximum for the road, or if it tilts beyond a certain threshold, an automatic warning is issued. In the event of an accident, the GPS module identifies the geographical coordinates of the location, and the GSM module sends an SMS to the pre-registered emergency and personal contacts. This system is able to detect any causality in every possible direction and confirms if the accident occurred or not. On the findings, the exact location in longitude and latitude form is sent to the authorized number through SMS. On any nonfatal situation, drivers have the full privilege on cancelling the notification sending system.

An **Accident Detection System** using Arduino is a compact, low-cost solution designed to detect and alert for accidents in real-time. This type of system is often used in vehicles, especially motorcycles, to improve road safety by automatically notifying emergency contacts or authorities if an accident occurs.By using open-source hardware like Arduino, this project is accessible and highly customizable for hobbyists, students, and professionals alike, making it a valuable tool in the realm of accident detection and prevention.

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## II. ACCIDENT DETECTION SYSTEM OVERVIEW

The proposed system comprises both hardware and software modules. The hardware includes a GPS module, GSM module, accelerometer, vibration sensor, and a Micro Electro Mechanical System (MEMS) sensor, all interfaced with an Arduino Uno, which serves as the controller. Utilizing Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technologies, the system has been developed to measure the vehicle's velocity and tilt. The accelerometer gauges the speed and extent of tilt when the vehicle strikes an object or rolls over. Simultaneously, the vibration sensor and MEMS sensor detect the impact, relaying the information to an ARM controller.

If an accident is detected by our system, the buzzer is immediately turned on which we initially affix with the vehicle. In case of less severity of the accident or no causality, if the driver wishes not to notify anyone, we have given the privilege to cancel out the notification sent. If the buzzer is turned off within a given threshold time, no message is sent to the authorized number. After any accident detected, our system waits for the threshold time to run out. If the threshold time has run out but the buzzer is not turned off indicates an accident actually occurred and authorized persons must be notified. Thus an automated message is generated containing a Google map address of the accident location and sent to the authorized number from the number which is already inserted in our system. Since the system is able to identify the exact location of the accident through GPS, thus the accident spot is easily traceable and can be reached within short time.

## III. COMPONENTS

*A. GPS HARDWARE*

GPS hardware on buses continuously determines their location, transmitting real-time data to a central server. The server processes this information, displaying it on a map interface accessible through websites or mobile apps. This allows transit agencies, operators, and passengers to track buses, view routes, and receive accurate arrival time predictions. Integrated with alerts and analytics, the system enhances overall transit efficiency, providing timely information to passengers and aiding transit agencies in optimizing routes and services.

B. GSM Module

The use of GSM technology in monitoring and controlling transformer load is a highly efficient and cost-effective means of communication. With its deterministic character, GSM enables the remote control of DC motors, stepper motors, temperature sensors, and solid-state relays through a simple message sent via a GSM modem. This eliminates the need for manual operation and transportation, making it an ideal solution for industrial controls, automobiles, and appliances. The SIM900A modem, equipped with a SIM900A GSM chipandRS232 interface, allows for easy connection to a computer or microcontroller using USB to Serial or RS232to TTL converters.. With its reliability and ease of use, GSM technology is the preferred choice for remote control and monitoring application.

GPS Trackers on Vehicles:

Each vehicle in the road is equipped with a GPS tracker device. This device communicates with GPS satellites to determine the precise location of the vehicles.

Accident Detection:

Using the accelerometers and vibration sensors sudden, abrupt change in speed and position is analyzed and determined whether an accident has occurred

Information Transmission:

The central server processes the incoming data from all buses in the fleet. It updates the buses locations on a map.

Alerts and Notifications:

Emergency responders can receive alerts and notifications about accident location,time and geographic coordinates through the application

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## IV. SOFTWARE SPECIFICATION

- GPS Integration: Each bus is equipped with a GPS module to gather location data at regular intervals
- GSM Module: The GSM module ensures communication between the bus and the server by sending the real-time location
- Frontend Interface: The system offers a user-friendly mobile or web application for passengers to view real-time bus locations

## V. EXISTING SYSTEM

Current real-time bus tracking systems widely use GPS and GSM technology to enhance urban transportation services. These systems provide passengers with real-time bus locations and estimated arrival times via mobile apps or websites. Transit operators benefit from tools to monitor buses, analyze fleet performance, and respond to issues in real-time.

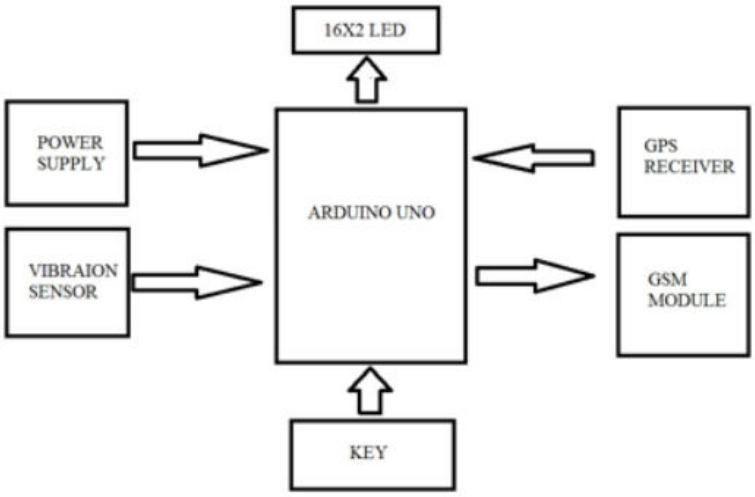


Fig 2: Proposed solution

The GPS is utilized to trace the current bus situation and transfer the knowledge to the server therefore which is formally accepted by the employment to track their conveyor's locations and details. Overall this validates the information it collects and uploads it to the server of the scheme which is succeeding utilized by the application. The functionalities of the current tracking the spot, arrival, and departure time of the bus, and proposing this knowledge on a map integrated dosing the Google Maps API.

## VI. PROPOSED SYSTEM

If an accident is detected by our system, the buzzer is immediately turned on which we initially affix with the vehicle. In case of less severity of the accident or no causality, if the driver wishes not to notify anyone, we have given the privilege to cancel out the notification sent. If the buzzer is turned off within a given threshold time, no message is sent to the authorized number. After any accident detected, our system waits for the threshold time to run out. If the threshold time has run out but the buzzer is not turned off indicates an accident actually occurred and authorized persons must be notified. Thus an automated message is generated containing a Google map address of the accident location and sent to the authorized number from the number which is already inserted in our system. Since the system is able to identify the exact location of the accident through GPS, thus the accident spot is easily traceable and can be reached within short time.

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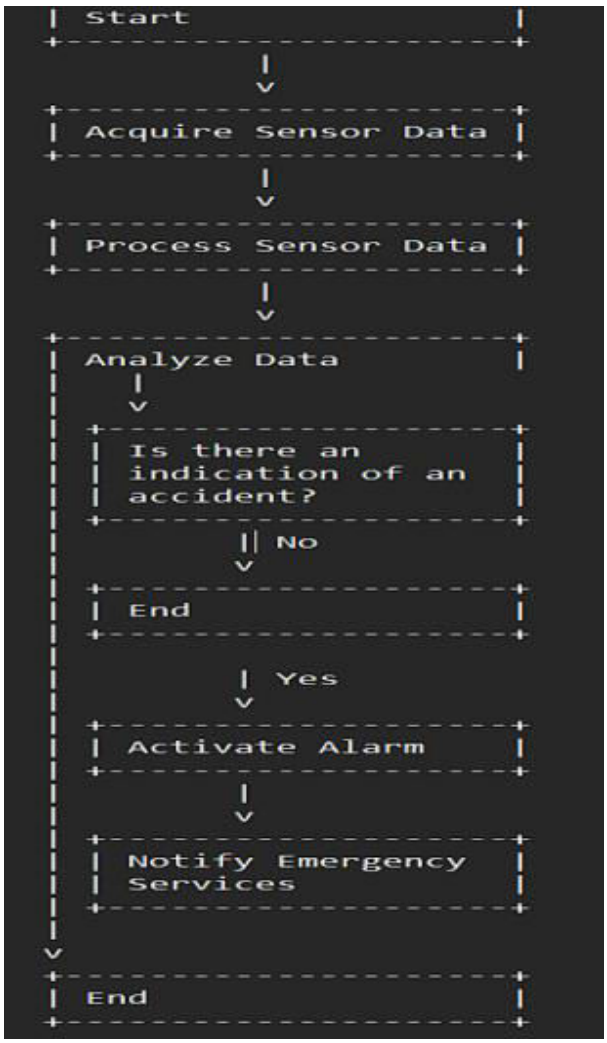


Fig 2: Flow chart of proposed solution

## VII. IMPLEMENTATION OF PROJECT

The Accident Detection and Response System embodies a comprehensive solution aimed at swiftly identifying and responding to vehicular accidents. Operating seamlessly in the background on a user's smartphone, this system continuously monitors the vehicle's movements through integrated sensors. In the event of a potential accident, such as a sudden impact or deceleration, the system's sophisticated algorithms swiftly recognize the anomaly. Instantaneously, the application triggers a sequence of actions: it sends detailed accident information, including precise location and vehicle specifics, directly to local emergency services. Simultaneously, it notifies the user, presenting options for emergency assistance and further confirmation. If confirmed by the user, within a specified timeframe, the system forwards additional detailed information to emergency responders. It may also activate in-vehicle safety measures, ensuring quick access for emergency aid. Ultimately, this system's seamless operation, immediate accident detection, and rapid response mechanism significantly reduce emergency response times, thereby enhancing overall road safe.inducing situations.

The main objective of this is to reduce the accidents in roads by using MSP430micro-controller will detect any tilt in an vehicle and when there is tilt an interrupt is generated and sends a control signal to the smart phone application through a Arduino module.

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An extra module, Camera, is included for further enhancement of the Accident Alert System, which will take picture of the driver in regular intervals and send them to a server via wi-fi. This will help in jugding the behaviour of the driver while driving.

PROTOTYPE:

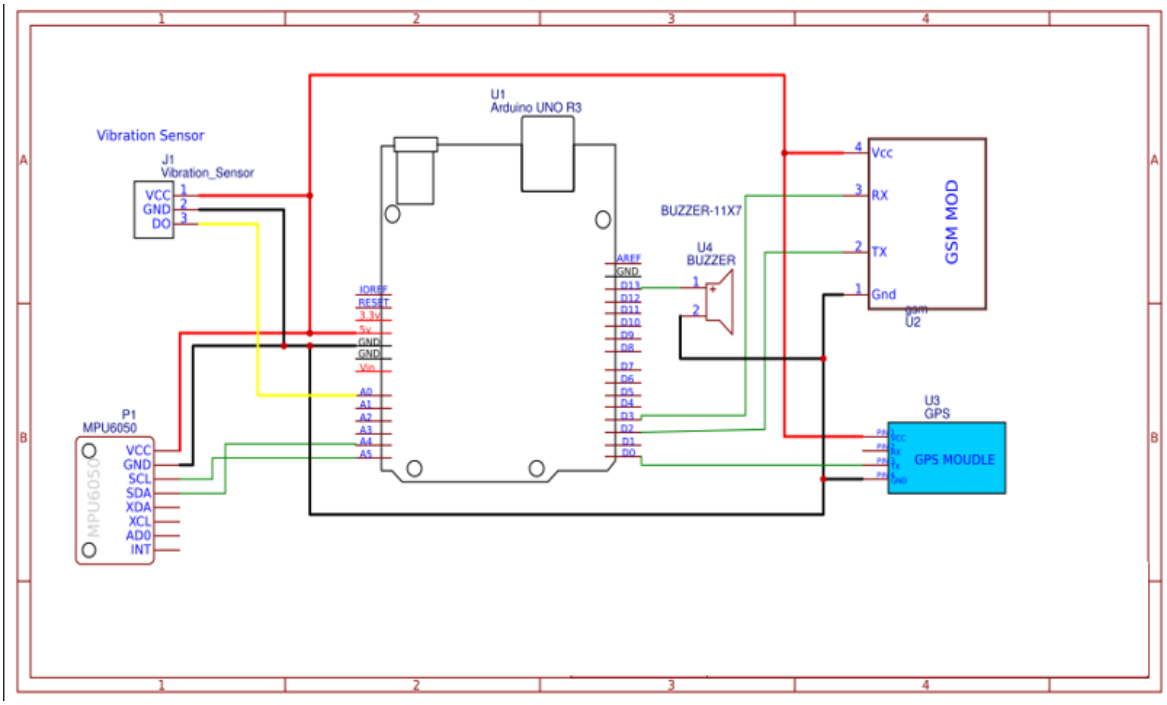


Fig 3: Model of the Proposed System

## VIII. ADVANTAGES

- Real-time Accident Detection: Leveraging smartphone sensors (such as accelerometers and GPS) to detect abrupt changes in vehicle motion indicative of accidents.
- Immediate Response Activation: Upon detecting a potential accident, the app will instantly notify emergency services and designated contacts with precise accident location and vehicle details.
- In-Vehicle Safety Measures: Activation of in-vehicle safety features (e.g., airbag deployment, hazard light activation) to facilitate quick access for emergency responders.
- User Empowerment: Providing real-time accident alerts to users, fostering awareness and encouraging proactive safety measures

## IX. FUTURE WORK

- Adding more sensors to detect other parameters such as airbag deployment, seat belt status, etc. Adding a voice call feature to communicate with the driver or emergency services. Adding a web server or an app to display and store the crash data..

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