Vehicle Accident Alert System

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Abstract: Road accident rates are very high nowadays .One of the basic reasons for road accidents is speed. Many lives could have been saved if emergency services could get accident information and reach in time. This project deals with accident detection system when the accident occurs it uses various components and alerts the rescue team for help. The proposed system will detect the occurrence of the accident and alert the nearby medical center about the accident to provide immediate medical aid. It reads the exact latitude and longitude of the vehicle involved in the accident and sends this information to nearest emergency service provider. Thus the systems will make the decision and sends the information to the smartphone, connected to the accelerometer through GSM and GPS modules . The Android application in the mobile phone will send text messages to the nearest medical center and friends. The goal of the project is to detect accidents and alert the rescue team in time.

Keywords: *Accident Detection System , Accelerometer ,GPS , GSM.*

I. INTRODUCTION

In today's era, vehicles are the important part of the human's daily life. The usage of vehicles have increased rapidly over the past decades. The major reason for the death rates over the world is due to the road accidents. The increasing number of vehicles has also increased not only the road accidents but also traffic hazards. The main aim of a vehicle tracking system is to enhance vehicle security, while the accident alert system focuses on rescuing people in accidents. These improved security systems, using advanced technologies like GPS, enable vehicle owners to monitor, track, and analyze vehicle movements and past activities. Vehicle tracking systems, often covertly installed, continuously or on command send location data to a monitoring unit. Additionally, the accident alert system detects accidents, identifies their location, and sends GPS coordinates to specified devices, ensuring timely rescue operations.

II. OBJECTIVES

The project aims to design a reliable accident alert system that ensures real-time detection and immediate notifications to emergency responders or predefined contacts. By leveraging GPS and GSM technologies, the system improves response times by transmitting precise accident locations. It enhances road safety by facilitating fast communication in emergencies, reducing fatalities, and offering a practical solution for vehicle tracking and monitoring.

III. SCOPE

- Enhance vehicle security through real-time tracking and theft detection using GPS.
- Provide instant accident alerts with location details to enable timely rescue efforts.
- Facilitate monitoring of vehicle movements and history for better management and safety.

IV. PROBLEM STATEMENT

The rise in vehicle thefts and delayed accident responses highlights the need for a system that combines real-time vehicle tracking and accident detection. Using GPS, such a system can enhance security by monitoring movements, detecting accidents, and instantly alerting owners or emergency services with precise location details.

V. SYSTEM ARCHITECTURE

In this system, the external disturbance is detected by the accident detection module and when it is detected, a function is called to find the current location of the user with the help of GPS in the Location Detection Module. The location data obtained from the GPS is sent to the emergency services to request help**.**
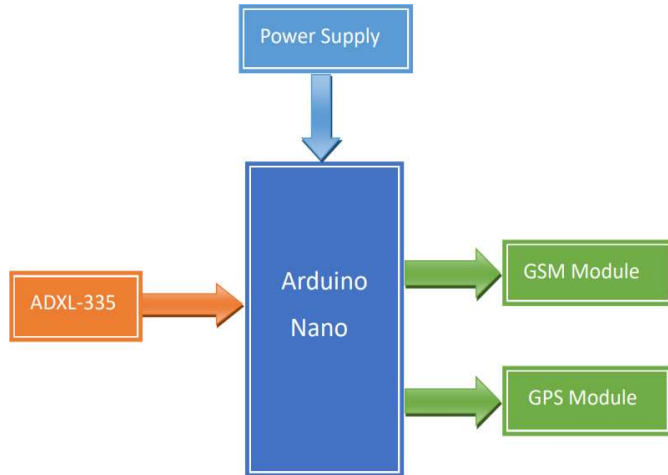
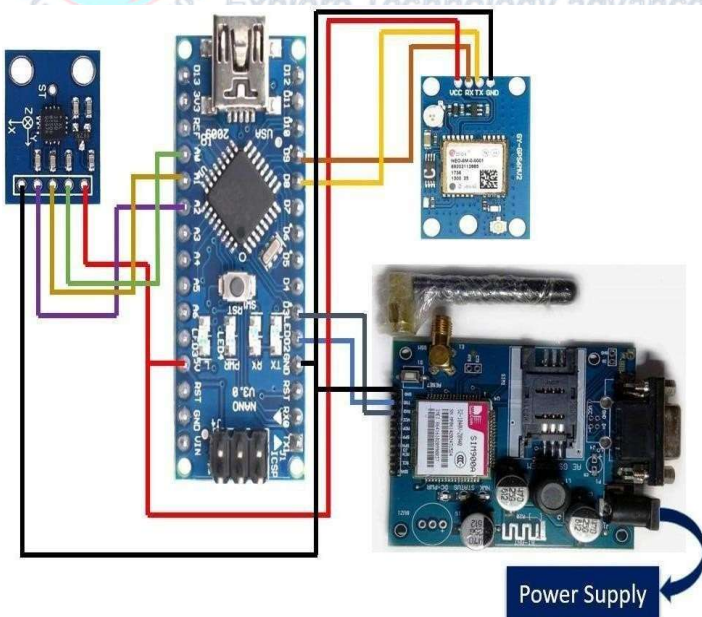

Fig 1: Block diagram

Fig 2: Circuit Diagram

VI. REVIEW OF COMPONENTS

1. *Arduino Nano :*The Arduino Nano is a compact, versatile, and breadboard-friendly microcontroller board based on the ATmega328P (or ATmega168 for older versions). Arduino Nano Pinout contains 14 digital pins, 8 analog pins, 2 Reset pins & 6 Power pins .It is programmed using Arduino IDE, which can be downloaded from the Arduino Official site.

Specifications
- Microcontroller: ATmega328P (16 MHz)
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V via Vin pin
- Maximum current rating is 40mA
- Digital I/O Pins: 14 (6 can be used as PWM outputs)
- Analog Input Pins: 8
- Memory: 32 KB flash
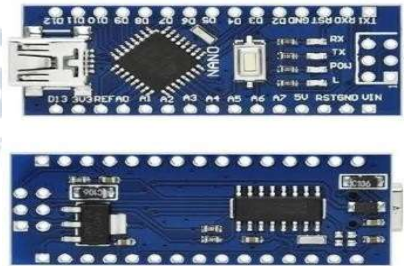- USB Interface: Uses a Mini-USB connector for programming and power.

Fig 3: Arduino Nano

2. *ADXL-335 Sensor :* The ADXL335 is a small, low-power, triple-axis analog accelerometer that measures acceleration in the X, Y, and Z directions. It is commonly used for motion and tilt detection in a variety of applications.

Specifications
- Axes: Measures acceleration in 3 axes (X, Y, Z)
- Output Type: Analog voltage (one pin per axis)
- Measurement Range: ±3 g (g = acceleration due to gravity)
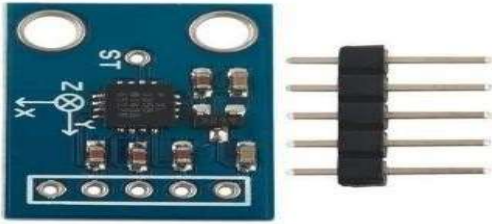
- Operating Voltage: 1.8V to 3.6V

Fig 4: ADXL-335 Sensor

3. **GSM SIM 900a :** The **GSM SIM900a** is a compact and cost-effective GSM/GPRS module used for wireless communication. It allows devices to send and receive SMS, make and receive calls, and access the internet via GPRS.

Specifications
- **Network Support:** Dual-band GSM (900/1800 MHz)
- **Functions:** SMS, voice calls, GPRS for data
- **Interface:** UART (TX, RX) for communication with microcontrollers
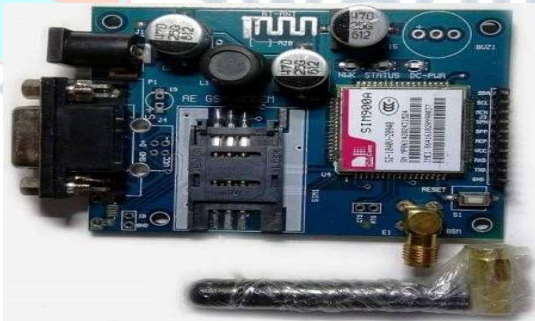- **Supply Voltage:** 3.4V to 4.4V (typically 4V)

Fig 5: GSM SIM 900a

Limitations
- **2G Only:** Not compatible with 3G, 4G, or 5G networks.
- **Regional Restrictions:** Limited to countries using 900/1800 MHz bands.
- **Low Data Speeds:** GPRS is slow for modern applications.
- **No GPS:** Requires additional hardware for location-based services.

4 . **GPS Neo- 6M:** The GPS Neo-6M is a compact GPS module that provides precise location data by connecting to GPS satellites. It is widely used in navigation and tracking applications.

Specifications
- **Position Accuracy:** ~2.5 meters
- **Interface:** UART (TX, RX) for communication
- **Operating Voltage:** 3.3V to 5V

GPS Neo- 6M Fig 6:
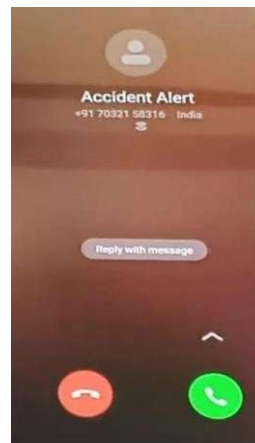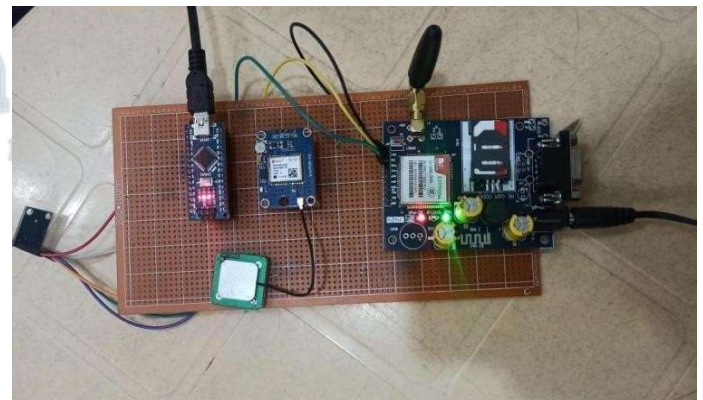
VII. **RESULTS**

Fig 7 : Result of Vehicle Accident Alert System

VIII.   FUTURE ENHANCEMENT

In future we would like to extend the framework with more functionalities. For better implementation, the system needs to integrate with the current built-in device in the car. With this integration, user do not need some extra devices to work as an accident detector. We can add the details of the user so that the rescue authorities who receives the accident message can get to know if he/she is taking any medication regarding their health issues so that the rescue team will be prepared according to that. We may even try to connect with our smart-watch.

IX.   CONCLUSION

The system effectively detects accidents using accelerometer data and GPS location. It sends SMS alerts and calls emergency contacts with the location of the accident. The integration of GSM and GPS modules ensures timely communication, helping improve safety and response. By automatically alerting emergency services, the system can reduce the time it takes for first responders to reach the accident scene. This can improve the chances of survival and reduce the severity of injuries. This device offers the most realistic alternative to the inadequate emergency services given to victims of road accidents. With the aid of this technology, when an accident happens, prompt action can be taken by alerting the appropriate individuals by sending a message.

AUTHOR'S PROFILE

Lellela Mounika pursuing her B.Tech from MVSR Engineering College, Nadergul , Hyderabad .She is interested in leaning VLSI technology and Embedded Systems and also to get some experience in chip designing .

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