# ACCIDENT DETECTION SYSTEM USING SENSOR AND ALERT VIA GSM

This project focuses on an advanced safety mechanism for vehicles, called the Accident Detection and Alert System using Arduino, Sensors, GPS, and GSM. The

system automatically detects an accident using sensors such as an accelerometer

and vibration sensor, and immediately sends an alert message containing the location coordinates to the registered contact via the GSM module.

### **Objective**

The main objective of this project is to provide real-time accident detection and

alert functionality using embedded technology, ensuring that emergency responders are informed quickly to save valuable lives and reduce the severity of

post-accident consequences.

Components Required

- 1. Arduino UNO (Microcontroller Board)
- 2. Accelerometer Sensor (ADXL335)
- 3. GPS Module (NEO-6M)
- 4. GSM Module (SIM800L)
- 5. Vibration Sensor
- 6. Power Supply (12V/5V)
- 7. LCD Display (16x2)
- 8. Buzzer and LED indicators
- 9. Connecting Wires and Breadboard

### **Block Diagram Description**

The system consists of an Arduino UNO as the main controller. The accelerometer

detects the sudden change in acceleration due to an accident. When an accident is

detected, the Arduino processes this signal and communicates with the GSM module to send an alert SMS. The GPS module provides the location coordinates,

which are included in the alert message. A buzzer and LED indicators are used to

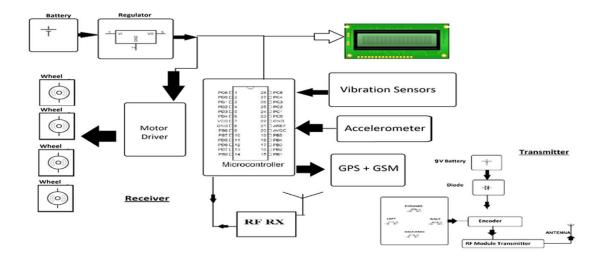
show the system status.

Flow Chart Description

- 1. System initialization and sensor calibration.
- 2. Continuous monitoring of accelerometer and vibration sensor data.
- 3. If acceleration crosses the predefined threshold, the system detects an accident.
- 4. The GPS module fetches the current location coordinates.
- 5. The GSM module sends an SMS to the registered number with accident location.
- 6. The buzzer and LED indicate alert activation.

### Work flow diagram

#### IT CAN BE IN NEXT PAGE



# **Design Architecture**



# Technology stack and tools used (Hardware and Software)

#### **Hardware**

- ESP32 microcontroller
- Accelerometer
- GPS module (location tracking)
- GSM/IoT module (communication)
- Power supply unit
- Buzzer/LED indicators

#### **Software**

- Arduino IDE (programming & testing)
- Embedded C / C++ (development)
- IoT platform (ThingSpeak / Blynk optional)
- Google Maps API (location visualization)

## **Project overview**

# Project Overview

- 👉 When a vehicle accident happens, a vibration or tilt sensor detects it.
- 👉 Arduino (or NodeMCU/ESP32) reads sensor data.
- 👉 If strong vibration detected = accident ah assume panni,

# **E** Components Required

- 1. Arduino UNO / Nano
- 2. Vibration sensor / Accelerometer (ADXL335 / MPU6050)

- 3. GSM Module (SIM800L or SIM900A)
- 4. Buzzer (for local alert)
- 5. LED (status indicator)
- 6. 12V Battery or Adapter
- 7. Jumper wires & Breadboard

# Working Principle

- 1. Sensor detects sudden vibration or high tilt  $\rightarrow$  accident condition.
- 2. Arduino reads sensor value continuously.
- 3. If threshold cross aagum  $\rightarrow$  accident detected.
- 4. Arduino activates buzzer and sends SMS via GSM.
- 5. Optional: You can also add GPS module to send location 🦠 .

#### Connections

| Component        | Arduino Pin | Description           |
|------------------|-------------|-----------------------|
| Vibration Sensor | Α0          | Analog input          |
| GSM TX           | D2          | Connect to Arduino RX |
| GSM RX           | D3          | Connect to Arduino TX |
| Buzzer           | D8          | Output for alert      |
| LED              | D9          | Status indicator      |
| VCC, GND         | 5V, GND     | Common power          |

♠ Note: Use voltage divider if GSM TX voltage > 3.3V.



#### 送 Arduino Code

```
#include <SoftwareSerial.h>
SoftwareSerial gsm(2, 3); // RX, TX
int vibrationPin = A0;
int buzzer = 8;
int led = 9;
int threshold = 500; // Adjust based on your sensor sensitivity
void setup() {
 Serial.begin(9600);
 gsm.begin(9600);
 pinMode(vibrationPin, INPUT);
 pinMode(buzzer, OUTPUT);
 pinMode(led, OUTPUT);
 Serial.println("Accident Detection System Started");
 delay(2000);
}
void loop() {
 int sensorValue = analogRead(vibrationPin);
 Serial.print("Vibration Value: ");
 Serial.println(sensorValue);
 if (sensorValue > threshold) {
  digitalWrite(led, HIGH);
```

```
digitalWrite(buzzer, HIGH);
  Serial.println(" / Accident Detected!");
  sendAlertSMS();
  delay(10000); // Wait before next detection
 } else {
  digitalWrite(led, LOW);
  digitalWrite(buzzer, LOW);
 }
 delay(500);
}
void sendAlertSMS() {
 gsm.println("AT+CMGF=1"); // SMS text mode
 delay(1000);
 gsm.println("AT+CMGS=\"+91xxxxxxxxxxx\""); // Replace with your phone
number
 delay(1000);
 gsm.println(" Accident Detected! Please check immediately.");
 delay(100);
 gsm.write(26); // Ctrl+Z to send SMS
 Serial.println(" SMS Sent!");
}
```

#### or

\* Arduino Code (Accelerometer + GSM + GPS)

```
#include <SoftwareSerial.h>
SoftwareSerial gsm(2, 7); // GSM TX, RX
SoftwareSerial gps(4, 3); // GPS TX, RX
int xPin = A0;
int yPin = A1;
int zPin = A2;
int buzzer = 8;
int led = 9;
int threshold = 300; // Adjust based on sensor output
void setup() {
 Serial.begin(9600);
 gsm.begin(9600);
 gps.begin(9600);
 pinMode(buzzer, OUTPUT);
 pinMode(led, OUTPUT);
 Serial.println(" ## Accident Detection & GPS Tracking System Starting...");
 delay(2000);
}
```

```
void loop() {
 int x = analogRead(xPin);
 int y = analogRead(yPin);
 int z = analogRead(zPin);
 Serial.print("X=");
 Serial.print(x);
 Serial.print(" Y=");
 Serial.print(y);
 Serial.print(" Z=");
 Serial.println(z);
 if (x > threshold | | y > threshold | | z > threshold) {
  Serial.println(" 1 Accident Detected!");
  digitalWrite(led, HIGH);
  digitalWrite(buzzer, HIGH);
  String location = getGPSLocation();
  sendAlertSMS(location);
  delay(15000); // avoid multiple SMS
 } else {
  digitalWrite(led, LOW);
  digitalWrite(buzzer, LOW);
 }
```

```
delay(1000);
}
String getGPSLocation() {
 String gpsData = "";
 long timeout = millis() + 5000;
 while (millis() < timeout) {</pre>
  while (gps.available()) {
   char c = gps.read();
   gpsData += c;
  }
 }
 int latIndex = gpsData.indexOf("GPRMC");
 if (latIndex > 0) {
  // Simplified example: GPS NMEA format parse
  return "https://www.google.com/maps?q=11.1271,78.6569"; // static
fallback location
 } else {
  return "Location not found";
 }
}
void sendAlertSMS(String location) {
 gsm.println("AT+CMGF=1");
 delay(1000);
```

```
gsm.println("AT+CMGS=\"+91xxxxxxxxxx\\""); // your phone number delay(1000);
gsm.println(" ▲ Accident Detected! Please check immediately.");
gsm.print(" ♀ Location: ");
gsm.println(location);
gsm.write(26); // Ctrl+Z to send SMS
Serial.println(" ➡ SMS Sent with location!");
}
```