NANDHA ENGINEERING COLLEGE

ERODE–638052 (Autonomous)

(Affiliated to Anna University, Chennai)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

22AIC14 – INTERNET OF THINGS AND ITS APPLICATIONS

MINI PROJECT REPORT ON

TOPIC – VEHICLE ACCIDENT DEDICATION SYSTEM

Submitted by

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BONAFIDE CERTIFICATE

This is to certify that the project work entitled " VEHICLE ACCIDENT DETECTION SYSTEM " is the Bonafide work of NAVEEN PRASATH V(22AI031), PREM KUMAR R(22AI039), RAJESHKANNA U.M (22AI040) who carried out the work under my supervision.

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Submitted for End semester PBL review held on _____

VEHICLE ACCIDENT DETECTION SYSTEM

AIM:

An AIM for Vehicle Accident Detection System refers to an Artificial Intelligence Model (AIM) designed to automatically detect vehicle accidents using a combination of sensor data, machine learning algorithms, and real-time monitoring.

SCOPE:

The scope for a Vehicle Accident Detection System is vast, as it encompasses multiple aspects of safety, technology, and transportation. The growing demand for road safety, especially with the increasing number of vehicles, advancements in autonomous driving, and the need for effective emergency response systems, creates significant opportunities for such systems.

BRIEF HISTORY:

The evolution of vehicle accident detection systems is closely tied to advancements in automotive safety, sensor technology, and artificial intelligence (AI). The goal of these systems has always been to improve road safety by detecting accidents in real-time, reducing response times, and enabling automated emergency interventions

PROPOSED METHODOLOGY:

The proposed methodology for a Vehicle Accident Detection System involves the integration of sensors, microcontrollers, and communication modules to ensure timely detection and response to road accidents. The system employs accelerometers or gyroscopic sensors to monitor sudden changes in velocity, orientation, or impact forces that indicate a potential collision. These sensors are interfaced with a microcontroller, such as an Arduino or ESP32, which processes the data and identifies accident scenarios based on predefined thresholds.

In case of an accident, the system activates alert mechanisms, such as buzzers or lights, and sends real-time notifications via GSM or GPS modules. The GPS module provides the precise location of the accident, while the GSM module transmits this information to predefined emergency contacts or services. To enhance reliability, the system can include additional features like alcohol sensors to detect intoxicated driving or temperature sensors to monitor engine conditions.

For IoT integration, data can be transmitted to cloud platforms for remote monitoring and analysis. A mobile app or web dashboard can further enable users or authorities to track vehicle status and receive notifications. This methodology ensures a cost-effective, scalable, and real-time solution for accident detection, improving road safety and emergency response times.

COMPONENTS REQUIRED:

S.NO	COMPONENTS	NO'S
1	GPS NEO6M	1
2	GSM 900A	1
3	VIBRATION SENSOR	1
4	JUMBER WIRE	As required

DESCRIPTION:

The GPS NEO-6M module plays a crucial role in a vehicle accident detection system by providing real-time location and speed data. It continuously tracks the vehicle's latitude, longitude, and speed, allowing the system to accurately determine the vehicle's position at any given time. If an accident occurs, the GPS module logs the location and speed at the moment of the crash, which is vital for emergency responders to quickly reach the accident site. Additionally, if the system detects a sudden change in speed (such as rapid deceleration or braking), the GPS data helps confirm whether an accident has occurred. The module can also be used to send location data automatically to emergency services, reducing response times. By integrating with other sensors like accelerometers or cameras, the NEO-6M GPS helps enhance the overall accident detection system, enabling it to monitor driving behavior, detect potential risks, and improve safety through more accurate crash detection and location-based alerts.

The GSM 900A module is a vital component in a vehicle accident detection system, enabling communication between the vehicle and emergency services. This GSM module operates over the 900 MHz frequency band, allowing it to send and receive SMS messages or make voice calls, even in remote locations where other communication systems might be

unavailable. When an accident is detected, the GSM 900A can be used to send an SMS alert with critical information, such as the vehicle's GPS location, accident severity, and time of the event, directly to emergency responders or pre-programmed contacts (like family members or fleet managers). This quick communication helps reduce response times, enabling faster assistance for the accident victims. The GSM 900A module can also be integrated with other sensors in the system, such as GPS for location tracking and accelerometers for detecting impact, ensuring that the system can send real-time data to aid in accident resolution. In essence, the GSM 900A enhances the vehicle accident detection system by enabling reliable, real-time communication in emergency situations.

The vibration sensor is an essential component of a vehicle accident detection system, used to detect sudden changes in the vehicle's motion, such as impacts, collisions, or crashes. The sensor works by measuring the vibrations or shocks that occur when the vehicle experiences abnormal forces, like rapid deceleration or a sudden stop. During an accident, the vibration sensor picks up these changes in the vehicle's movement and triggers an alert to the system. This data can be used to identify the severity of the impact, whether it’s a minor bump or a major collision. In combination with other sensors like GPS and accelerometers, the vibration sensor helps confirm that an accident has occurred, enabling the system to send notifications to emergency services or other predefined contacts. By quickly detecting and responding to these vibrations, the sensor plays a key role in improving the accuracy and timeliness of the vehicle accident detection system, ensuring faster assistance and potentially saving lives.

A JUMPER WIRE is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit.

CODING:

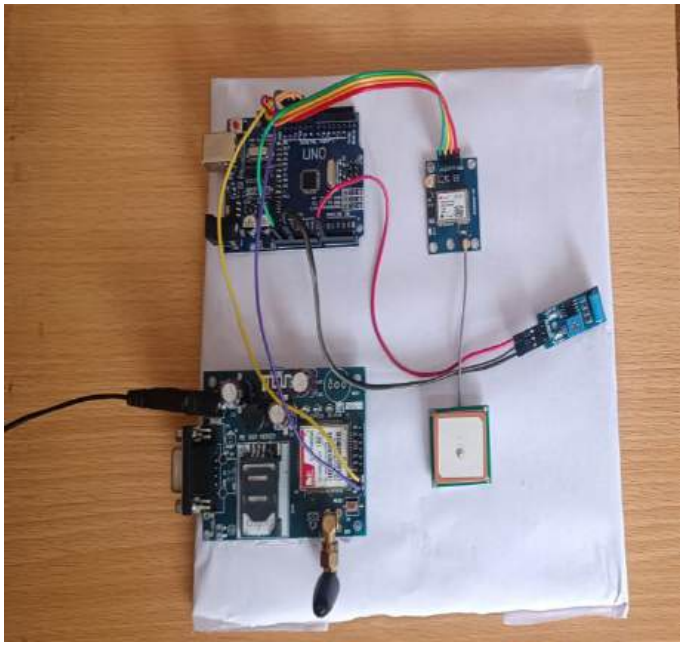
```
#include <SoftwareSerial.h>
#include <TinyGPS++.h>
```

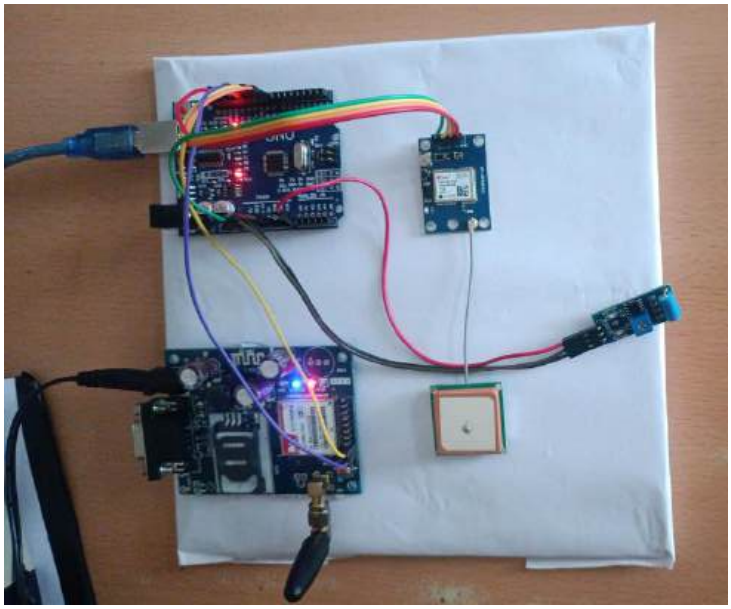
```
// Initialize GSM and GPS
SoftwareSerial gsm(10, 11);
SoftwareSerial gps(8, 9);
TinyGPSPlus gpsData;

const int vibrationPin = A0;
const int threshold = 300;

String emergencyContact = "+1234567890"; // Replace with actual number

void setup() {
  pinMode(vibrationPin, INPUT);
  Serial.begin(9600);
  gsm.begin(9600);
  gps.begin(9600);

  Serial.println("System Initialized");
  delay(2000);
}

void loop() {

  int vibrationValue = analogRead(vibrationPin);
  Serial.print("Vibration Value: ");
  Serial.println(vibrationValue);
```

```
  if (vibrationValue > threshold) {
    Serial.println("Accident detected!");
    sendAccidentAlert();
    delay(10000);
  }


  while (gps.available()) {
    if (gpsData.encode(gps.read())) {
      Serial.println("GPS Data Updated");
    }
  }
}

void sendAccidentAlert() {
  String gpsLocation = getGPSLocation();
  if (gpsLocation != "") {
    String alertMessage = "Accident detected! Location: " + gpsLocation;
    sendSMS(emergencyContact, alertMessage);
  } else {
    sendSMS(emergencyContact, "Accident detected! Unable to fetch location.");
  }
}
```

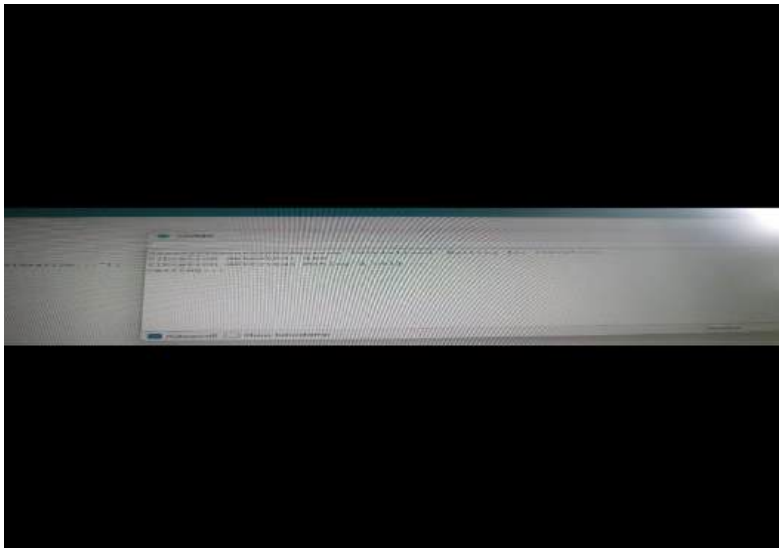
```
String getGPSLocation() {
  if (gpsData.location.isValid()) {
    float latitude = gpsData.location.lat();
    float longitude = gpsData.location.lng();
    return "https://maps.google.com/?q=" + String(latitude, 6) + "," +
String(longitude, 6);
  } else {
    return "";
  }
}

void sendSMS(String number, String message) {
  gsm.println("AT+CMGF=1");
  delay(1000);
  gsm.println("AT+CMGS=\"" + number + "\"");
  delay(1000);
  gsm.print(message);
  delay(1000);
  gsm.write(26);
  delay(5000);
  Serial.println("SMS Sent: " + message);
}
```

SCREENSHOTS:





OUTPUTS:



LIMITATIONS:

1.Accuracy Issues

False positives (e.g., sharp turns misidentified as accidents) and false negatives (minor accidents missed).

2.Hardware Constraints

Sensor failures and power disruptions can hinder detection.

3.Connectivity Dependence

Requires strong network/GPS connectivity for real-time reporting.

4.Cost and Maintenance

High installation and maintenance costs limit accessibility.

5.Privacy and Security Risks

Potential misuse of collected accident and location data.

FUTURE ENHANCEMENTS:

1.AI Integration for Better Accuracy

Use machine learning algorithms to reduce false positives and false negatives by analyzing diverse accident scenarios.

2.Enhanced Sensor Technology

Incorporate advanced sensors like LiDAR, thermal imaging, and improved accelerometers for precise accident detection.

3.Offline Functionality

Develop systems that can operate without network dependency, using onboard storage and processing for local detection and response.

4.Real-time Data Sharing

Enable direct communication with nearby vehicles and emergency services

through Vehicle-to-Everything (V2X) technology.

5.Cost Reduction

Focus on affordable hardware and scalable solutions to make accessible for all vehicle types, including older models.

6.Improved Privacy Measures

Implement end-to-end encryption and anonymized data handling to address privacy and security concerns.

CONCLUSION:

The Vehicle Accident Detection System is a transformative innovation that enhances road safety by enabling swift accident detection and response. By leveraging advanced sensors, GPS, and communication technologies, it significantly reduces emergency response times, potentially saving lives and minimizing the impact of road accidents.