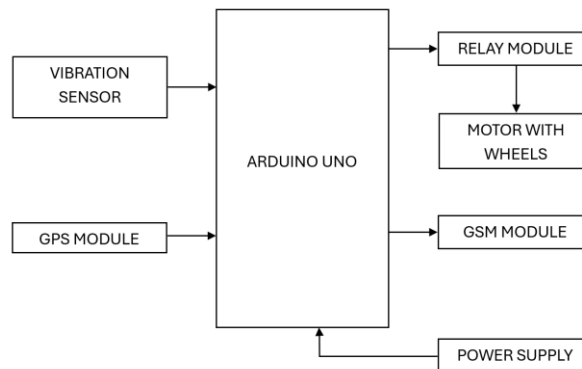


**REAL TIME VEHICLE TRACKING SYSTEM FOR THEFT PREVENTION
USING ESP8266 AND GPS****Mr. Ram Prasad**Assistant Professor, Department of Computer Science and Engineering,
J.B Institute of Engineering and Technology, Moinabad**Eerla Shiva Shankar, Mothkupally Tharun, Durgam Vidya, Kyasthu Gangalaxmi**UG Students, Department of Computer Science and Engineering,
J.B Institute of Engineering and Technology, Moinabad**ABSTRACT**

The Vehicle Anti-Theft System using GPS is an IoT-based security solution designed to track and protect vehicles from theft. The system integrates GPS (Global Positioning System) and GSM (Global System for Mobile Communication) technologies to provide real-time vehicle location tracking and instant alerts. A microcontroller such as Arduino or ESP32 receives location data from the GPS module and transmits it to the owner's mobile via SMS or a mobile application through the GSM module. In case of unauthorized vehicle movement, the system immediately sends the current location coordinates to the owner. Additional features such as engine lock control or buzzer activation can prevent theft attempts. The system ensures continuous vehicle monitoring, offering high accuracy and reliability. Compact, low-cost, and energy-efficient, this project is suitable for cars, bikes, and transport vehicles, enhancing vehicle safety and supporting smart transportation systems.

Block Diagram:**INTRODUCTION**

The Vehicle Anti-Theft System using GPS is developed to address the growing problem of vehicle theft through real-time tracking and alerting. Traditional security systems only trigger local alarms, which are ineffective if the owner is far from the vehicle. This system overcomes that limitation by integrating GPS and GSM modules with a microcontroller to provide global tracking capabilities. The GPS module continuously fetches the vehicle's latitude and longitude coordinates, while the GSM module transmits this data to the owner's mobile phone as an SMS or through an app. Whenever the vehicle is moved without authorization, the system instantly sends an alert containing its exact location, enabling quick recovery and preventive action.

The system's operation is managed by a microcontroller (Arduino UNO or ESP32) that processes data from various modules. A vibration or motion sensor can be added to detect physical tampering or unauthorized movement. When the sensor detects unusual activity, it triggers the system to send a real-time alert to the registered user. The owner can then track the vehicle on a map or even remotely disable the ignition system to prevent theft. The system also stores the last known location in case of signal loss, ensuring tracking continuity. The hardware setup is compact and suitable for easy installation in any vehicle type.

The Vehicle Anti-Theft System using GPS provides security, convenience, and peace of mind for vehicle owners. Its IoT-based design allows integration with cloud services for real-time data storage and analysis. Future upgrades could include mobile app-based geofencing, voice alerts, or AI-based predictive theft detection. The system can also be connected to emergency services for faster recovery in case of theft. It is reliable, cost-effective, and scalable for both personal and commercial vehicles. This smart system enhances vehicle security and contributes to developing intelligent transportation systems in smart cities.

PROBLEM STATEMENT

Traditional vehicle security measures are no longer sufficient to handle modern threats. Devices such as alarms and locks provide only passive protection, and once a thief bypasses them, the owner has no way to determine the location or movement of the stolen vehicle. Commercial GPS tracking devices offer some level of monitoring but are often prohibitively expensive, require complex installations, or rely on GSM networks that incur recurring charges. Furthermore, many existing systems are not integrated into cloud platforms and therefore cannot provide continuous, real-time updates accessible from anywhere in the world. The core problem is the absence of an affordable, IoT-based tracking solution that provides accurate, continuous, and remote monitoring of a vehicle's location. Therefore, this project aims to design a low-cost, Wi-Fi-based system that can track a vehicle in real time and provide owners with immediate access to position data stored securely on the cloud.

PROPOSED SYSTEM

The proposed system is designed to provide improved vehicle protection by combining GPS tracking, GSM communication, and automatic control functions. In the proposed method, a vibration sensor is attached to the vehicle body. Under normal conditions, the sensor remains inactive. Whenever someone attempts to move or tamper with the vehicle, the sensor detects vibration and sends a signal to the Arduino UNO.

After receiving the signal, the Arduino UNO immediately activates the GPS module to obtain the real-time coordinates of the vehicle. The coordinates are then forwarded to the GSM module. The GSM module sends an SMS alert to the vehicle owner containing the warning message and exact location of the vehicle.

The proposed system also includes a relay module connected to the motor or engine ignition. After detecting unauthorized movement, the relay disconnects the engine supply and prevents the vehicle from moving further. Thus, the proposed system not only identifies the theft attempt but also helps in preventing the vehicle from being stolen.

Compared with traditional alarm systems, the proposed system provides better reliability because the owner receives the vehicle location directly on a mobile phone. The system is compact, low cost, and suitable for cars, bikes, and other transport vehicles.

Advantages of the Proposed System

1. Provides real-time vehicle tracking.
2. Sends immediate SMS alerts to the owner.
3. Prevents theft by stopping the engine through relay control.
4. Works continuously with low power consumption.
5. Can be installed easily in any vehicle.
6. Low-cost and suitable for personal as well as commercial vehicles.

OBJECTIVES

The primary objectives of this project are clearly defined to address the critical need for accessible vehicle tracking:

- **Real-Time Location Monitoring:** Develop a system capable of tracking vehicle location in real-time using GPS technology with accuracy within 5-10 meters in open environments.
- **Theft Prevention and Recovery:** Provide vehicle owners with immediate location data during theft incidents, enabling quick recovery and law enforcement coordination.
- **Continuous Operation:** Implement a dual-mode system that operates both online (cloud-based) and offline (local storage) to ensure uninterrupted tracking capability.
- **Cost-Effective Solution:** Design an affordable tracking system using readily available, low-cost IoT components suitable for installation in various vehicle types.

- **User-Friendly Interface:** Create an intuitive web-based dashboard and mobile application for easy access to real-time location information.
- **Data Security and Privacy:** Implement secure data transmission and storage mechanisms to protect sensitive location information.

SYSTEM ARCHITECTURE

The overall system architecture of the proposed Vehicle Anti-Theft System consists of four major units: sensing unit, processing unit, communication unit, and control unit. The sensing unit contains the vibration sensor and GPS module. The vibration sensor continuously monitors any unauthorized movement or tampering of the vehicle. Once vibration is detected, the GPS module immediately starts acquiring the current latitude and longitude of the vehicle.

The processing unit is built around the Arduino UNO microcontroller. It receives the vibration signal from the sensor and location data from the GPS module. The Arduino processes these inputs and decides whether the movement is authorized or unauthorized. If the movement is found to be suspicious, the Arduino activates the GSM module and the relay module.

The communication unit consists of the GSM module. The GSM module sends an alert message to the registered owner. The SMS contains the vehicle status and GPS coordinates. The owner can use these coordinates to track the vehicle location through map applications.

The control unit consists of the relay module, motor, and buzzer. The relay is connected to the vehicle ignition system or motor. When theft is detected, the relay can automatically disable the motor to stop the vehicle. At the same time, the buzzer gives an audible alert.

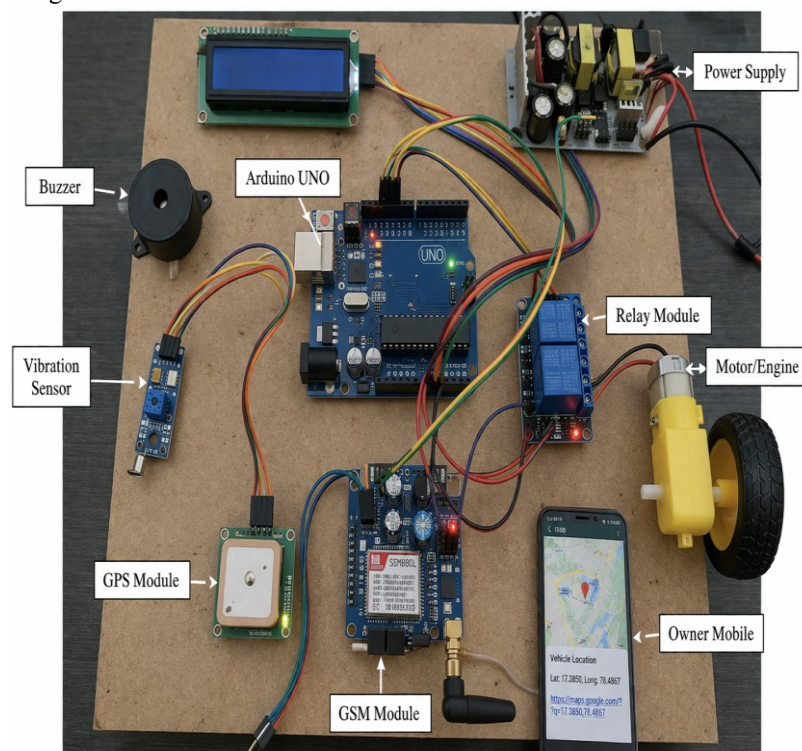


Figure 1. System architecture of the proposed GPS-based vehicle anti-theft system.

METHODOLOGY

The methodology of the project is divided into six stages.

Step 1: Power Supply Initialization

The power supply provides the required voltage to the Arduino UNO, GSM module, GPS module, vibration sensor, and relay. The circuit starts working when power is supplied.

Step 2: Monitoring the Vehicle

The vibration sensor continuously monitors the vehicle body. If there is no movement, the system remains in standby mode.

Step 3: Theft Detection

When the vehicle is moved without authorization, the vibration sensor generates a signal. This signal is given to the Arduino UNO.

Step 4: GPS Data Collection

After receiving the theft signal, the Arduino activates the GPS module. The GPS module reads the current latitude and longitude values.

Step 5: SMS Alert Transmission

The Arduino transfers the GPS coordinates to the GSM module. The GSM module sends an SMS alert to the owner. A sample alert message is:

“Alert! Vehicle movement detected. Location: 17.3850° N, 78.4867° E.”

Step 6: Engine Locking

Finally, the Arduino activates the relay module. The relay disconnects the motor or engine power supply, thereby preventing further movement of the vehicle.

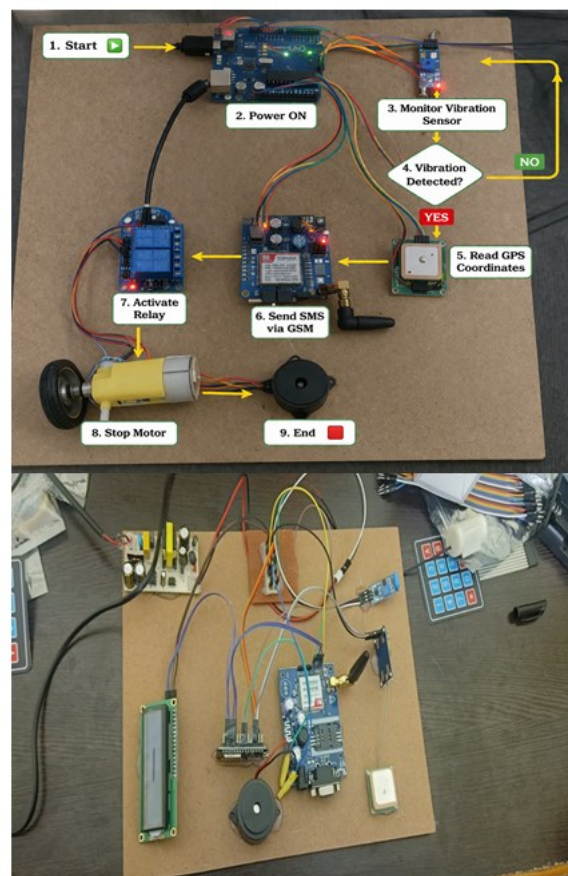


Figure 2. Flowchart of the vehicle anti-theft system methodology.

Figure 2. Flowchart of the vehicle anti-theft system methodology.

RESULTS AND ANALYSIS

The developed Vehicle Anti-Theft System was tested under different operating conditions. During testing, the vibration sensor was used to simulate unauthorized vehicle movement. The system successfully detected all movement conditions and immediately triggered the GSM and GPS modules.

The GPS module accurately determined the location of the vehicle with only a small error of a few meters. The GSM module successfully sent alert messages to the registered mobile number within a few seconds. The average response time of the system was approximately 5 to 10 seconds after detecting movement.

The relay module also functioned correctly by disconnecting the motor supply whenever theft was detected. As a result, the motor stopped immediately, demonstrating the capability of the system to prevent further vehicle movement.

The LCD display showed system status such as “Vehicle Safe,” “Theft Detected,” and “Sending Alert.” The buzzer also generated an audible warning. Therefore, the system proved to be reliable, fast, and effective.

Analysis Table

Parameter	Observed Result
Vibration Detection	Successful
GPS Accuracy	Approximately 3–5 meters
SMS Alert Time	5–10 seconds
Relay Response	Immediate
Motor Stop Function	Successful
Overall System Performance	Reliable and Efficient

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CONCLUSION

The Vehicle Anti-Theft System Using GPS is an effective and reliable solution for protecting vehicles from theft. The system integrates Arduino UNO, vibration sensor, GPS module, GSM module, relay module, and buzzer to provide complete vehicle security.

Whenever unauthorized movement occurs, the vibration sensor detects the movement and sends the information to the Arduino UNO. The GPS module determines the location of the vehicle, while the GSM module sends the coordinates to the owner through SMS. The relay disconnects the motor supply and prevents the vehicle from moving.

The developed system successfully achieved the objectives of theft detection, vehicle tracking, and automatic protection. It is low-cost, easy to install, energy efficient, and suitable for use in cars, bikes, and other transport vehicles. Therefore, the proposed system can be widely used as a practical security solution in modern transportation.

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