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 – SMART VEHICLE SECURITY SYSTEM

Submitted by

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BONAFIDE CERTIFICATE

This is to certify that the project work entitled "SMART VEHICLE SECURITY SYSTEM" is the Bonafide work of MADHAN.V(22AI025),SABARISREE.M.Y(22AI043),HEMAMITHRAN.R.S(22AI060)) who carried out the work under my supervision.

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SMART VEHICLE SECURITY SYSTEM

AIM:

To design and implement an IoT-based vehicle security system that ensures the safety of vehicles by monitoring their status, detecting thefts, and providing real-time location tracking through a web interface.

SCOPE:

Vehicle Security:
The system provides real-time status updates and alerts in case of unauthorized vehicle access or movement.

1. **IoT Integration:**
   Utilizes Wi-Fi connectivity for remote monitoring and control through a web server interface.
2. **Location Tracking:**
   Offers real-time GPS tracking capabilities to monitor the location of the vehicle in case of theft or other emergencies.
3. **Control Features:**
   Allows remote control of the vehicle's operational status (e.g., locking and unlocking) via the web interface.
4. **User-Friendly Interface:**
   Displays vehicle status and location information on an interactive webpage, enhancing usability.
5. **Applications:**
   Suitable for private and commercial vehicles, fleet management, and car rental services.

BRIEF HISTORY:

Traditional Vehicle Security Systems:

Historically, vehicle security systems relied on mechanical locks and later evolved to include alarm systems triggered by unauthorized access.

Emergence of GPS Technology:

GPS integration allowed real-time location tracking, enhancing vehicle recovery during theft scenarios.

Advent of IoT in Vehicle Security:

The Internet of Things (IoT) revolutionized vehicle security by enabling remote monitoring and control. IoT systems provide advanced features like geofencing, real-time alerts, and connectivity through mobile apps or web interfaces.

Modern IoT Vehicle Security:

Contemporary systems leverage Wi-Fi, GSM, and cloud platforms for seamless and robust security solutions. The current project integrates these elements into a cohesive system, emphasizing simplicity, accessibility, and functionality.

PROPOSED METHODOLOGY:

1. **Hardware Setup:**
    1. Use an **ESP8266 Wi-Fi module** as the central controller for managing IoT communication and interfacing with peripherals.
    2. Connect the **LiquidCrystal I2C LCD** for real-time display of vehicle status.
    3. Integrate a **vibration or motion sensor** to detect unauthorized movement or tampering.
    4. Use **digital pins** to read sensor data for detecting vehicle theft or unauthorized access
    5. Connect **GPIO pins** to relay modules for controlling the vehicle ignition or locking system.
    6. Ensure reliable power supply and battery backup for continuous operation in case of power interruptions.
    7. Implement a GPS module for real-time location tracking.
2. **Software Configuration:**
    1. Write a program to handle web server functions, user commands, and automated responses based on sensor inputs.
    2. Create a responsive web page to display:

1. Vehicle status (e.g., normal or theft alert).
2. Real-time location using embedded Google Maps links.
3. Options for controlling the vehicle remotely (e.g., turning it ON/OFF)

3. Configure notifications through the web interface for theft alerts or vehicle movement detection.
4. Calibrate input from sensors (e.g., motion sensor) to ensure accuracy and reduce false alarms.
5. Automate theft detection to trigger actions such as locking the vehicle or sending location updates to the web interface.

3. **Operation:**

1. Continuously monitor the vehicle's sensors for any unauthorized activity.
2. If unauthorized access is detected:
3. Trigger a theft alert.
    - Lock the vehicle by activating GPIO pins connected to relays.
    - Update the web interface with real-time GPS coordinates and the status of the vehicle.
    - Users can access the web page to:

4.Check the current status of the vehicle.

- Track its real-time location through Google Maps.
- Toggle the vehicle ON or OFF remotely.

5.Send real-time alerts and updates to the user regarding vehicle status location changes.

COMPONENTS REQUIRED:

S.NO	COMPONENTS	NO'S
1	ESP8266 NodeMCU Module	1
2	Relay Module	1
3	Wi-Fi Module	1

4	Battery	1
5	Connecting Wires	As required
6	ESP32-CAM	1

DESCRIPTION:

This code implements an IoT-based vehicle security and tracking system using an ESP8266 microcontroller. It establishes a Wi-Fi connection, serves a web interface, and uses an LCD for local status display. The system monitors vehicle status via digital input, updates a web page with the status and location (GPS mock data), and provides control options to toggle vehicle security (ON/OFF). Theft alerts are displayed on the LCD and web interface when a specific condition is detected.

CODING:

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <SoftwareSerial.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

// WiFi Configuration
#define ssid      "cam"         // WiFi SSID
#define password  "project123"  // WiFi password

// LCD Configuration
LiquidCrystal_I2C lcd(0x27, 16, 2);
```

```
// Variables and GPIO Pin Definitions
int addr = 0;
int gp;
String t1 = "NULL";
String t2 = "NULL";
String etatLed = "";
ESP8266WebServer server(80);


// HTML Page Function
String getPage() {
   String page = "<html lang=fr-FR><head><meta http-equiv='refresh' content='2'/>";
   page += "<title>IOT BASED VEHICLE SECURITY SYSTEM</title>";
   page += "<style>body {background-color: #9AFEFF; font-family: Arial, Helvetica, Sans-Serif; Color: #000088;}</style>";
   page += "</head><body><h1>IOT BASED GAS BOOKING</h1>";
   page += "<ul><li>VEHICLE STATUS: " + t1 + "</li></ul>";
   page += "<ul><li>LOCATION: 11.1710 77." + String(gp) + "</li></ul>";
   page += "<ul><li>TRACK LOCATION: " + t2 + "</li></ul>";
   page += "<form action='/' method='POST'>";
   page += "<ul><li>" + etatLed;
   page += "<INPUT type='radio' name='LED' value='1'>VEHICLE ON";
   page += "<INPUT type='radio' name='LED' value='0'>VEHICLE OFF</li></ul><br>";
   page += "<INPUT type='submit' value='control'></form></body></html>";
   return page;
}
```

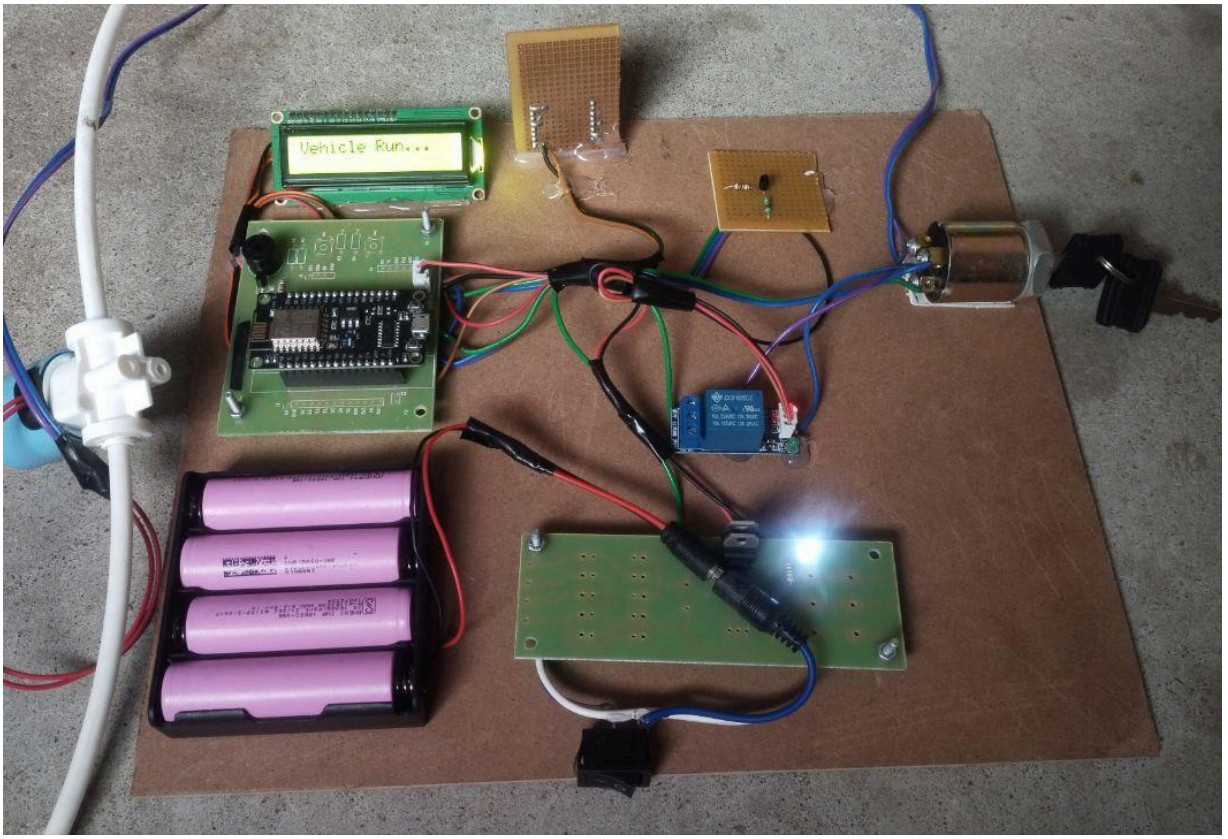
```
// Handle HTTP Root
void handleRoot() {
   if (server.hasArg("LED")) {
      handleSubmit();
   } else {
      server.send(200, "text/html", getPage());
   }
}

// Handle Submit Action
void handleSubmit() {
   String LEDValue = server.arg("LED");

   if (LEDValue == "0") {
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("VEHICLE OFF ");
      digitalWrite(14, HIGH);
      digitalWrite(15, HIGH);
      t1 = "VEHICLE LOCKED";
      t2 = "https://maps.app.goo.gl/D1Bf6Cg7Fpvxz62M8";
      etatLed = "OFF";
      delay(20000);
   } else if (LEDValue == "1") {
      lcd.clear();
      lcd.setCursor(0, 0);
```

```
        lcd.print("VEHICLE ON ");
        digitalWrite(14, LOW);
        digitalWrite(15, LOW);
        etatLed = "ON";
        t1 = "NORMAL";
        t2 = "https://maps.app.goo.gl/D1Bf6Cg7Fpvxz62M8";
        delay(1000);
    }
    server.send(200, "text/html", getPage());
}

// Setup Function
void setup() {
    // Initialize WiFi
    WiFi.softAP(ssid, password);
    server.on("/", handleRoot);
    server.begin();

    // Initialize LCD
    lcd.init();
    lcd.backlight();
    lcd.setCursor(0, 0);
    lcd.print("VEHICLE ");
    lcd.setCursor(4, 1);
    lcd.print("SECURITY");

    // Pin Configurations
```

```
    pinMode(15, OUTPUT);
    pinMode(14, OUTPUT);
    pinMode(12, INPUT_PULLUP);
    digitalWrite(15, LOW);
    digitalWrite(14, HIGH);

    // Initialize Random Seed
    randomSeed(analogRead(0));
    delay(1000);
    lcd.clear();
}

// Loop Function
void loop() {
    server.handleClient();
    gp = random(3701, 3793);

    if (digitalRead(12) == LOW) {
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Vehicle Run...");
        digitalWrite(14, LOW);
        digitalWrite(15, LOW);
        t1 = "NORMAL";
        t2 = "https://maps.app.goo.gl/D1Bf6Cg7Fpvxz62M8";
        delay(1000);
    } else {
```

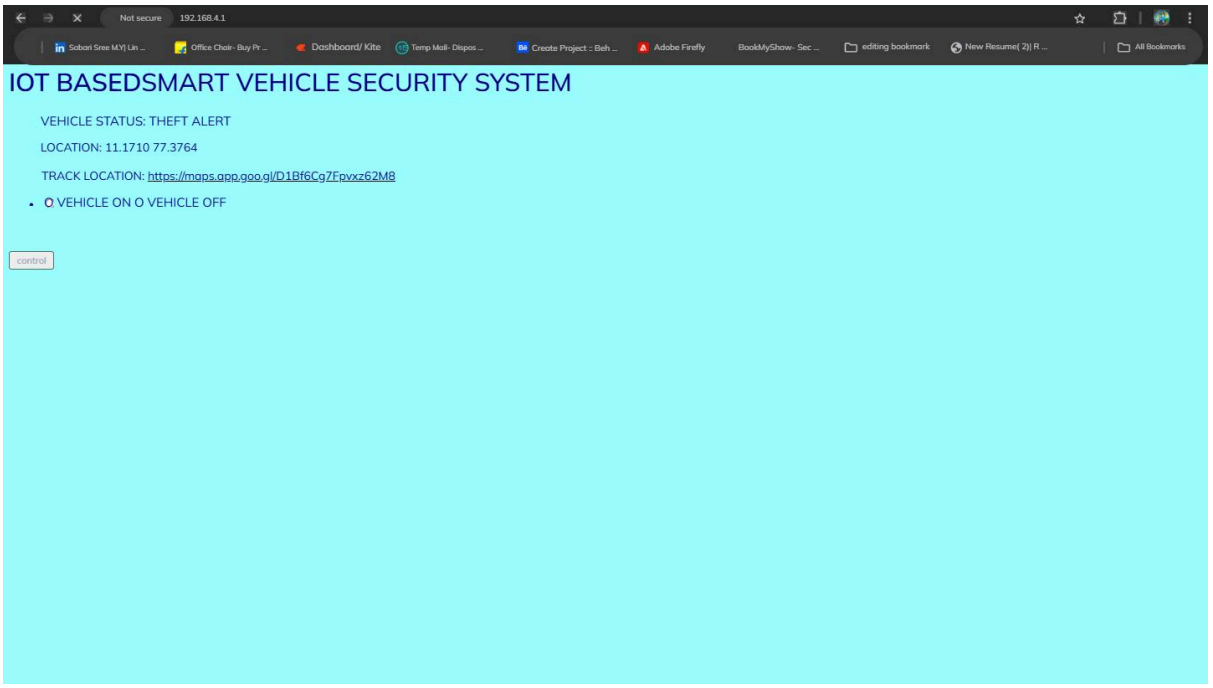
```
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("THEFT ALERT");
        digitalWrite(14, LOW);
        digitalWrite(15, HIGH);
        t1 = "THEFT ALERT";
        t2 = "https://maps.app.goo.gl/D1Bf6Cg7Fpvxz62M8";
        delay(1000);
    }
}
```

SCREENSHOTS:

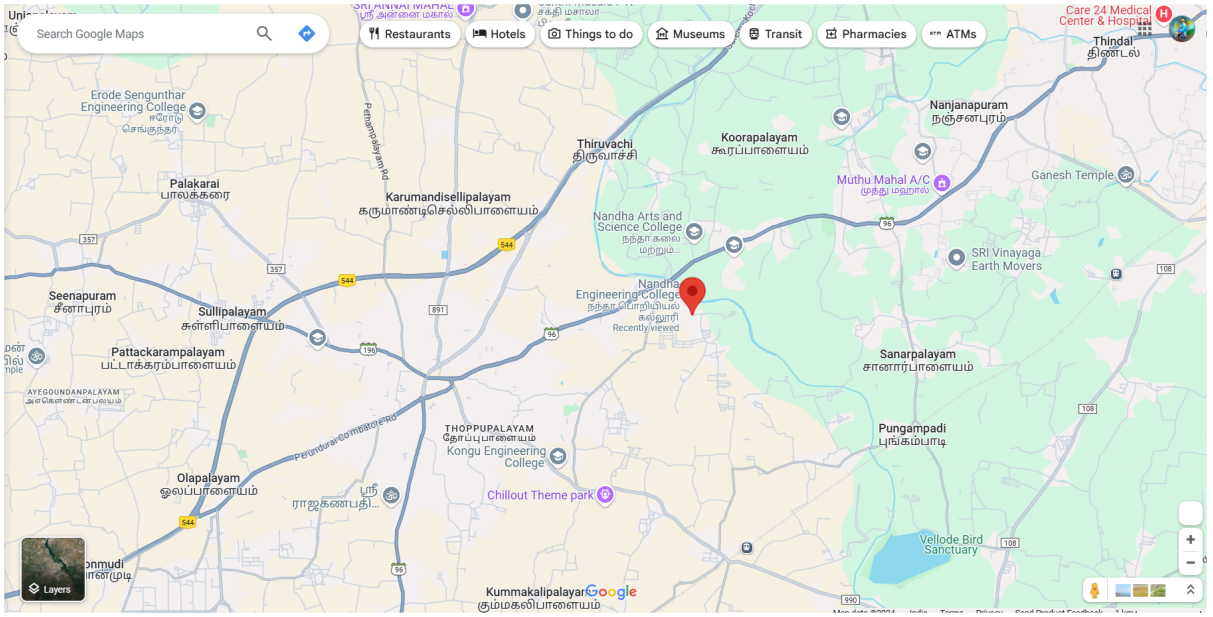


OUTPUTS:

This Screenshot defines the dashboard that displays the vehicle controller dashboard:



GPS tracking location



Protocol:

1. VEHICLE_STATUS: Sent by the onboard system to the cloud server to report the vehicle's status (e.g., "NORMAL", "THEFT ALERT").

2. LOCATION_UPDATE: Sent by the onboard system to the cloud server to report the vehicle's location (e.g., GPS coordinates).

3. CONTROL_COMMAND: Sent by the user's mobile device to the onboard system to control the vehicle's security features (e.g., "LOCK", "UNLOCK").

4. ALERT_NOTIFICATION: Sent by the cloud server to the user's mobile device to notify them of a potential theft or security breach.

LIMITATIONS:

1. The system uses simulated GPS data, lacking real-time location tracking.
2. Limited connectivity, relying solely on Wi-Fi with restricted range.
3. No secure encryption, making it vulnerable to hacking.
4. Dependent on vehicle power, with no backup supply.
5. Lacks advanced features like geofencing, motion detection, and emergency notifications.

FUTURE ENHANCEMENTS:

1. Integrating GPS modules for real-time location tracking.
2. Adding GSM/LTE connectivity for broader communication range.
3. Enhancing security with encryption and secure authentication protocols.
4. Including additional sensors (e.g., vibration, motion) for better theft detection.
5. Developing a dedicated mobile app for improved user experience.
6. Incorporating backup power sources for uninterrupted operation.

CONCLUSION:

The **IoT-Based Vehicle Security System** demonstrates the potential of IoT in enhancing vehicle safety through real-time monitoring, theft alerts, and remote control. Despite its current limitations, the project provides a solid foundation for further development. By addressing its shortcomings and incorporating advanced features, the system can evolve into a comprehensive and reliable solution for vehicle security in real-world applications.