GPS Based Vehicle Tracking System

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Abstract: This project aims to develop a real-time vehicle tracking system utilizing the integration of GPS and GSM technologies. The system comprises a GPS module that provides accurate positioning information, enabling tracking vehicles' location coordinates. The GPS module continuously collects location data, including latitude and longitude, with high precision. This data is then transmitted to a central server via a GSM module. The GSM module serves as the communication interface between the vehicle and the server. It establishes a wireless connection using the cellular network, enabling real-time data transmission.
This system incorporates various features to enhance its functionality. Real-time alerts can be set up for emergencies, such as unauthorized vehicle access or accidents. Historical data logging enables the analysis of vehicle routes, driving patterns, fuel consumption, and geo-fencing, facilitating logistics and operational efficiency optimization. Also facilitates prompt response in case of theft.

Keywords — **GPS module, GSM module, Vehicle- tracking, Geo -fencing**

I. INTRODUCTION

This project is known for Vehicle tracking systems based on GPS and GSM modules. Tracking vehicles has become increasingly important in various industries, such as transportation, logistics, and fleet management. With the advancements in technology, the integration of Global Positioning System (GPS) and Global System for Mobile Communication (GSM) modules has revolutionized vehicle tracking systems. This project aims to develop a comprehensive vehicle tracking system using GPS and GSM modules to accurately monitor the location and movement of vehicles in real time.

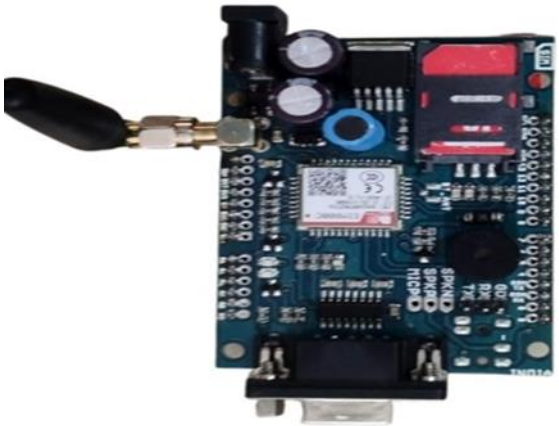
Regarding vehicle tracking systems, most of the research and work is done on a software basis. There is very less work done on the development and improvement of tracking systems based on both hardware and software work.

In this project, the focus will be on designing and implementing the hardware and software components required for the vehicle tracking system. The hardware setup will include a GPS module for location acquisition, a GSM module for data transmission, and a microcontroller unit to control the system operations. The software development will involve creating an intuitive user interface for data visualization and implementing a server-side application for data storage and analysis.

II. METHODOLOGY/EXPERIMENTAL

A. Components

- The implementation of any research requires careful consideration of its fundamental components. In our research, we have meticulously chosen the most essential tools and frameworks to ensure the utmost precision and accuracy in our findings. Our primary focus revolves around the incorporation of Arduino MEGA
- UbloxNEO-6m GPS module, GSM module. Additionally, our research demands an extensive knowledge of the coding related to libraries based on tracking systems. Hence, so to ensure a comprehensive understanding of the subject matter and as a software part, we are using Arduino IDE for coding related to Arduino.



2.1. Sim800C GSM module.

- With these robust components, we are confident in achieving groundbreaking results that will contribute significantly to the field.

2.1. UbloxNeo-6m GPS module.

B. Methodology

The software development process is a critical aspect of any research project, and choosing the right model is of utmost importance.

In our proposed research, we have chosen the Waterfall Model to ensure a streamlined and efficient approach to achieving our objectives.

1. System Design:
• Identify the hardware components required for the project, including the GPS module, GSM module, microcontroller (such as Arduino), and other supporting components.
• Design the circuitry and connections between the components, ensuring compatibility and proper power supply.

2. GPS Module Integration:
• Connect the GPS module to the microcontroller according to the manufacturer's specifications.
• Configure the GPS module to communicate with the microcontroller. This may involve setting up communication protocols and data formats.

3. GSM Module Integration:
• Connect the GSM module to the microcontroller, ensuring proper communication and power supply.
• Configure the GSM module to establish a connection with the mobile network and enable data transmission.

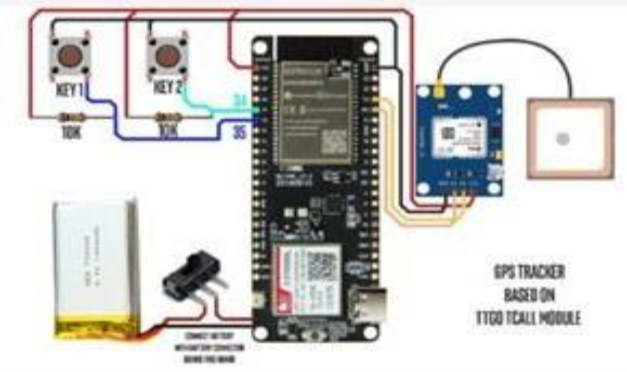
4. Data Processing and Storage:
• Set up the microcontroller to receive GPS data from the GPS module.
• Process the received GPS data to extract relevant information like latitude, and longitude.
• Store the processed data in a suitable format, such as an SD card, EEPROM, or external database.

5. Communication and Tracking:
• Establish communication between the microcontroller and the GSM module to send the processed GPS data.
• Use the GSM module to transmit the GPS data to a designated server or a remote device.
• Implement a tracking algorithm on the server or remote device to interpret the received GPS data and display the vehicle's location on a map.

6. Power Management:
• Incorporate a reliable power supply, including a backup power source, to ensure continuous operation even in the event of power failures.

7. Testing and Validation:
• Conduct thorough testing of the system to verify its functionality and accuracy.
• Perform field tests to evaluate the tracking system's performance in real-world conditions.
• Make any necessary adjustments or improvements based on the test results

So, this is the flowchart we followed to execute our program efficiently:-



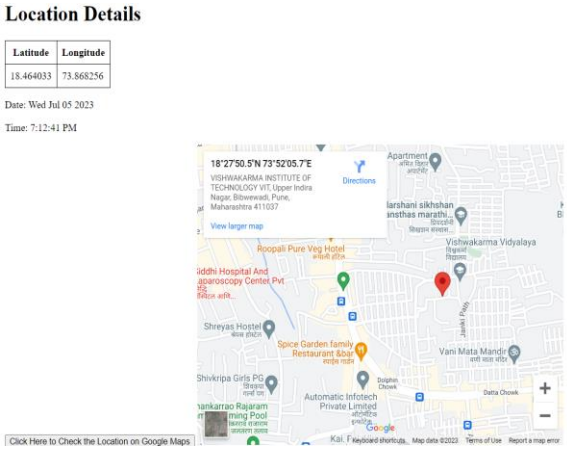
3.4. Circuit diagram.

III. RESULTS AND DISCUSSION

- First the program will be uploaded to Arduino. Then wait for the GPS to route the coordinate and for GSM

to get a phone line. After getting the coordinate, GPS will blink every 3-4 seconds.

- Same with GSM, after getting the line, it will blink for 3-4 seconds. The LED at GPS and GSM were blinking, which mean the coordinate was already locked and it was ready to send if receive a command from the user.
- The coordinate data can also be checked at the serial monitor at the IDE program. It will show the longitude, latitude, and time taken. The user's phone number will be exposed on the serial monitor.
- This program had been set up with its term to cooperate between the user and the vehicle tracking system.
- In this program two term was used which is ―START‖ and ―STOP‖. The ―START‖ term is used to activate the system, meanwhile the term ―STOP‖ for terminate the system.
- After receiving the ―STOP‖ command, the system will terminate the connection with the user but still route the latest coordinate. Once the user sent ―START‖ to the GSM module. The module will cooperate with Arduino and Arduino will extract data received by the GPS module.



4.1.html webpage.

These are the results obtained from our project demonstrating our proposed approach's effectiveness.

IV. FUTURE SCOPE

The future of this project is very important as many other features related to this topic can be introduced. The future scope of a project on tracking vehicles using GPS and GSM modules lies in leveraging emerging technologies like machine learning and artificial intelligence to enhance predictive maintenance, optimize route planning, and develop intelligent fuel management systems. Additionally, incorporating blockchain technology for secure data transmission and integrating IoT devices for real-time monitoring present innovative avenues for advancement.[5]

V. CONCLUSION

The real-life applications of this project are limitless. This project successfully demonstrated an innovative and efficient method for tracking vehicles using GPS and GSM modules. By integrating these technologies, real-time location tracking was achieved, allowing for enhanced fleet management, improved security, and efficient resource allocation. Additionally, the project implemented a unique feature, a smart route optimization algorithm, which intelligently suggested the most fuel-efficient and time-saving routes for vehicles. Overall, this project offers a reliable and cutting-edge solution for vehicle tracking, promising significant benefits in various fields.

VII. ACKNOWLEDGMENT

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Even some seniors from our colleges studying in the second and third years helped us as a guide.

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