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IoT Based GPS Tracking using NodeMCU and Matlab Visualization on ThingSpeak

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ABSTRACT

The IoT-based NEO 6M GPS Tracking System is a real-time location tracking solution that leverages GPS technology, MIT App Inventor, and ThingSpeak for data analysis and storage. The NEO 6M GPS module provides precise location data by connecting to satellites, making it suitable for vehicle tracking, asset management, and personal security. This system integrates the NEO 6M with an IoT framework to send real-time data to the cloud, where it can be remotely monitored and analyzed. The MIT App Inventor is used to create a mobile app for users to view GPS data, while ThingSpeak handles cloud storage and data visualization. Key components include the NEO 6M GPS module for location data, an ESP8266 microcontroller for wireless communication, and ThingSpeak for cloud-based analytics. The mobile app offers real-time location tracking with features like geo-fencing alerts. This versatile system can be applied to a wide range of use cases, from vehicle tracking to personal safety and asset management.

Key Words: *NEO 6M ,IOT,GPS,Thingspeak,Esp8266 Microcontroller.*

I. INTRODUCTION

With the increasing importance of real-time monitoring and location tracking, IoT (Internet of Things) has become a fundamental tool for addressing these needs. GPS tracking systems have found applications in many sectors, from fleet management and logistics to personal security and asset monitoring. This project, "IoT-based NEO 6M GPS Tracking System with MIT App Inventor and ThingSpeak," focuses on creating a simple yet effective solution for real-time GPS tracking using the NEO 6M GPS module integrated with IoT platforms.

The NEO 6M is a high-precision GPS module that can receive signals from multiple satellites and provide accurate latitude, longitude, and altitude data. Integrating this module with an IoT system allows for remote monitoring of location data via the internet. This integration is facilitated by using the ESP8266 microcontroller for Wi-Fi communication, enabling seamless data transmission to ThingSpeak, a cloud-based IoT analytics platform.

MIT App Inventor is employed to create a mobile application that interacts with the system, allowing users to view the real-time GPS data on their smartphones or tablets. This makes it easier to track the location of

vehicles, assets, or individuals without the need for specialized hardware. The application is designed with a user-friendly interface, providing features like real-time location updates, geo-fencing, and alerts.

This project is designed to be cost-effective, easy to implement, and scalable for various real-world applications. It highlights the potential of IoT-based systems in creating smarter, more efficient solutions for tracking and monitoring. The fusion of GPS technology, cloud computing, and IoT platforms like ThingSpeak enhances the system's capabilities, making it not only a tracking tool but also a data analysis platform that can provide insights based on location data.

II. PROBLEM STATEMENT

The primary problem addressed by this project is the need for a reliable, cost-effective, and real-time GPS tracking solution that can be remotely monitored and controlled. Current GPS tracking systems are often expensive or lack the flexibility of customization for specific applications. Additionally, many tracking systems do not offer the integration of IoT and cloud platforms, which limits the ability to analyze data and respond to geo-location-based events in real time.

The challenge is to develop a system that leverages low-cost hardware and open-source software while maintaining high accuracy in tracking. The system should be able to transmit GPS data to the cloud and provide a user-friendly interface for end-users to monitor and track assets or individuals from anywhere in the world.

III.PROPOSED METHODOLOGY

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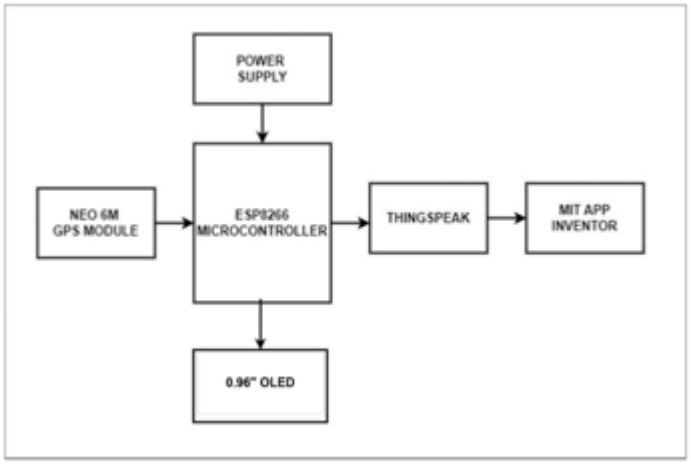

Fig:- Block Diagram of IoT Based GPS Tracking using NodeMCU and Matlab Visualization on ThingSpeak

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IV. FLOWCHART

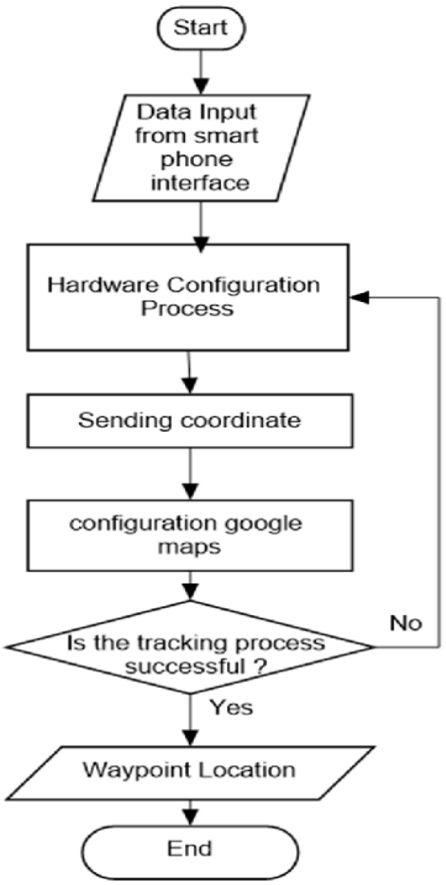


Fig:- Flowchart of IoT Based GPS Tracking using NodeMCU and Matlab Visualization on ThingSpeak

V. METHODOLOGY

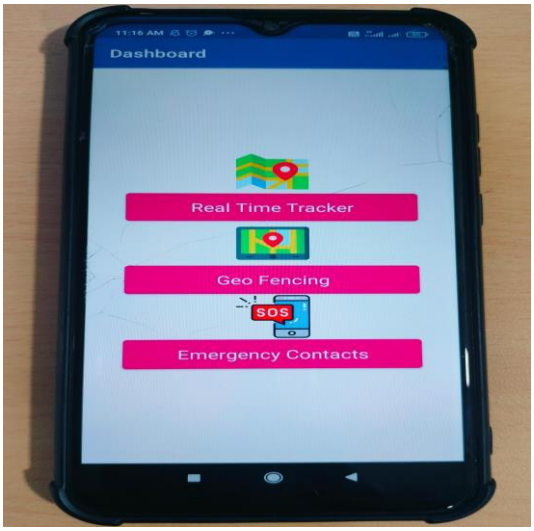
The methodology consists of several phases:

1. Hardware Setup: The NEO 6M GPS module is used to capture real-time location data, including latitude, longitude, and altitude. It interfaces with the ESP8266 microcontroller, which facilitates wireless communication between the GPS module and the cloud. Power management circuits will be incorporated to ensure reliable operation.
2. IoT Integration: The GPS data from the NEO 6M module is transmitted to ThingSpeak using the ESP8266 module. ThingSpeak allows for real-time data visualization, storage, and analysis. Various widgets and tools within ThingSpeak are used to present data in graphical formats.
3. Mobile Application Development: MIT App Inventor is utilized to create a custom mobile application. This app allows users to monitor GPS data in real time. The app communicates with the ThingSpeak cloud platform to retrieve the latest location data. It also includes features such as real-time tracking, geo-fencing, and location history.

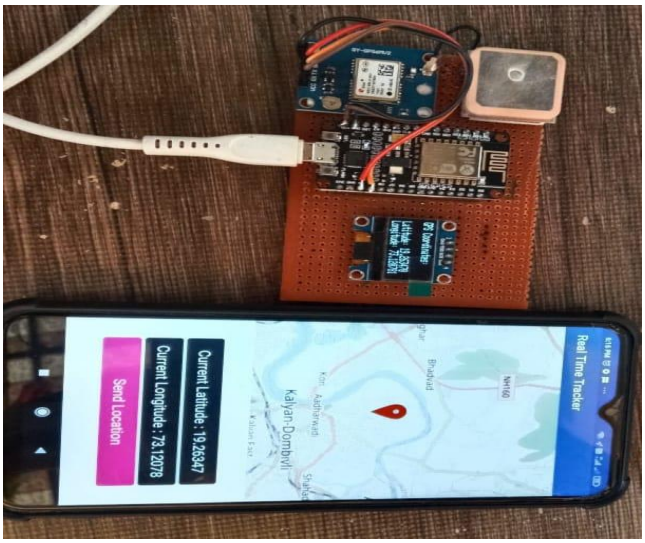
4. Software Development: Embedded code is written for the ESP8266 to collect data from the NEO 6M module, process it, and transmit it to ThingSpeak. Additionally, code is developed for the MIT App Inventor to allow the mobile app to retrieve and display this data.
5. Testing and Optimization: Once the hardware and software are set up, the system is thoroughly tested in different environments to ensure accuracy and reliability. The data transmission and retrieval processes are optimized to minimize lag and maximize efficiency.
6. Deployment: After successful testing, the system will be deployed for real-world use. This could involve vehicle tracking, asset monitoring, or personal safety applications.

VI. RESULT

1. HOME PAGE



2. LOCATION TRACK



VII. CONCLUSION

The system can be expanded with additional features such as real-time traffic monitoring, speed tracking, and route optimization. Battery optimization techniques can also be developed to extend the operational life of the device. The integration of machine learning models with ThingSpeak can allow for predictive analytics based on GPS data, such as predicting potential routes or alerting users of unusual behavior patterns. Further, integrating this system with more advanced IoT platforms or expanding the device's capability to work in areas with poor connectivity by using LoRa or GSM modules could greatly enhance its usability in remote regions.

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