

## **LORA TRACKING SYSTEM PROTOTYPE WITH GPS FUNCTIONALITY**

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**ABSTRACT** - LoRa is a reliable modulation system for IoT, while GPS aids in navigation. In Malaysia, the great outdoors is growing more and more popular, but many people have learned the hard way that the wilderness can be cruel if they are not prepared. The project's objective is to create a LoRa Tracking System with GPS functionality and assess its performance. The process entails building a testbed that includes a LoRa32 transmitter and receiver, a GPS module, and a Blynk tracking device. Tests evaluate the performance of the network, hardware, and functionality. Results show that as distance increases, signal strength (RSSI) and signal noise ratio (SNR) decrease, and transmission time increases. Environmental variables and distance have an impact on signal intensity. In open places, the coverage range is often several km, while it is less in areas with high populations. Signal strength, accuracy, and coverage are all improved when GPS and LoRa are combined. In conclusion, this study creates and evaluates the LoRa Tracking System with GPS functionality. Results show signal behavior and the advantages of integrating GPS. Future work will focus on increasing coverage and accuracy. Future studies will focus on increasing the transmission range and accuracy of GPS algorithms.

**Keywords:** LoRa, GPS, RSSI, SNR, Tracking System

### **1. INTRODUCTION**

LoRa32 is a device that utilizes the LoRa spread spectrum modulation system, offering long-range, low-power communication capabilities for IoT applications. GPS (Global Positioning System) is a satellite-based navigation system used to determine precise geographic positions on Earth. A tracking system combines the LoRa32 device with GPS functionality to enable accurate location tracking of objects or people. This combination allows for the development of efficient and reliable tracking solutions, making it suitable for applications such as asset tracking, security systems, and outdoor activities. The visualization of GPS data is visualized on Google map using Blynk cloud.

### **2. METHODOLOGY**

The method that was used to carry out this research is a development of a prototype tracking system using LoRa32 and interfaced with GPS. The prototype consists of two LoRa32 modules. One LoRa32 module is the transmitter and another one LoRa32 module is receiver. The transmitter module will interface with GPS to gather GPS data from satellites. Then the GPS data will be transmitted to the LoRa32 receiver and stored in the LoRa32 receiver. The LoRa32 receiver then sends GPS data to Blynk cloud and visualize it on Google map. The results obtained are then evaluated to understand LoRa32 and GPS performances.

### **3. RESULTS AND DISCUSSION**

Based on the results and evaluation of the LoRa tracking system prototype with GPS functionality, as the network performance, as the distance increases, the signal strength and the signal noise ratio decreases, however time taken for LoRa32 transmitter to transmit packet increased when the distance increased. The LoRa system's signal strength varies with distance and environment. In general, as the distance between the transmitter and receiver rises, the signal intensity drops. The surroundings, including the presence of structures, trees, and other obstructions, has an impact on the signal strength as well. In open places, the LoRa system's coverage range is often several kilometers, although it might be significantly smaller in populated areas. As the GPS receiver can be used to detect the location of the LoRa32 transmitter, which may assist to optimize the transmission power, the addition of GPS capabilities to the LoRa system can enhance the signal strength, signal noise ratio and coverage range.

#### **4. NOVELTY OF RESEARCH / PRODUCT**

Throughout the years, there have been several researches that conducted projects using LoRa and GPS, A Novel Smart Gas Stove with Gas Leakage Detection and Multistage Prevention System Using IoT LoRa Technology such as (Islam M et al, 2020). Other than that, Study of a bus location system with LoRa in Nonoichi city (Tasaka S et al, 2019). Lastly, research by Chitrakar P, Biradavolu Y, and Yellampalli S (2019) conducted GPS and LoRa module Based Safety Alert system.

#### **5. CONCLUSION**

To conclude the project entirely, it can be said that LoRa Tracking System with GPS functionality offers a low-cost, long-distance, and energy-efficient solution for real-time tracking and monitoring applications, enabling effective asset management, improved safety precautions, and increased operational efficiency. For the future works, The improvement of GPS localization algorithms accuracy. Enhance the coverage range that packet can be transmit from transmitter to receiver.

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