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# **Bus Tracking System using Python**

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**ABSTRACT:** The Bus Tracking System is an advanced GPS-based tracking solution designed to monitor and manage public transportation efficiently. The system employs an ESP32-WROOM microcontroller and the NEO-6M GPS module to collect and transmit real-time location data of buses. This data is then processed and displayed through a web or mobile application, enabling passengers and administrators to track bus movements accurately.

This project presents the development of a real-time Bus Tracking System designed to enhance public transportation visibility using Android and Firebase. The application enables passengers to monitor the live location of buses through a mobile interface integrated with Google Maps. The system is powered by GPS-enabled hardware (ESP32 + GPS module), which transmits real-time location data to Firebase. The Android application features secure user authentication via Firebase, with login and sign-up functionalities. Upon successful login, users are redirected to a dynamic map displaying live bus movement, ensuring transparency, efficiency, and reduced waiting time. This project aims to modernize urban mobility by offering a seamless digital solution for tracking public transport

**KEYWORDS:** Toxic comment detection, Long short term Memory, Convolutional Neural Networks, Naive Bayes, Support Vector Machine, Fasttext.

## **I. INTRODUCTION**

A Bus Tracking System for a College ensures efficient and real-time tracking of buses for students, faculty, and administrators. It uses GPS-enabled buses to transmit location data to a backend server, which processes and displays live locations on a mobile/web application. Students can check real-time bus locations, estimate arrival times (ETA), and receive notifications about delays or route changes. Drivers use the system to update their status, while administrators manage routes, schedules, and bus assignment. The main technology used to develop this system is Global Positioning System (GPS). GPS technology able to receives the position of an object from space-based satellite navigation system through a GPS receiver. Some programming languages such as will be used to develop the proposed system.

The developed bus tracking system will able to provide bus users a real time platform to check on updated bus traffic information, for examples bus arrival or departure time. Besides, this system also able to reduce workload for bus management team and provide an immediate platform to update latest and accurate bus traffic information to bus users.

### **Project Goal:**

Using Wi-Fi Module (ESP 8266) to transmit and receive signal.  
Using Blynk Sever to store database of the bus.  
Using GPS to detect the location of the bus.  
Using APPS to display the position and arrival time of the bus.

### **Hardware:**

- **ESP32 :**

The hardware used in this project is ESP32, and a GPS Module (GPS NEO6Mv2).

The **ESP32** is a powerful and versatile **Wi-Fi + Bluetooth** microcontroller developed by **Expressive Systems**. It is widely used in **IoT, smart home, robotics, and embedded systems** due to its **low power consumption, high processing capabilities, and extensive connectivity options**.

- **NEO6M:**

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance u-bloc 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options. Innovative design and technology suppress jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

**Feature Extraction:**

1. Real-Time GPS Data
  - Latitude & Longitude
  - Timestamp
  - Speed
  - Direction
2. Route Information
  - Bus ID / Number
  - Route ID
  - Start & End Stops

**II. METHODOLOGY**

- **Planning :**

Planning has been done in first stage. After discussion with project supervisor, the name for proposed project “Real Time Bus Tracking System” is produced. After confirmation of project title, studies on existing bus tracking system are performed. Unfortunately, there is only one University in provided bus tracking system on shuttle bus service.

- **Analysis:**

In this stage, analyses on existing systems have been made. Few bus tracking systems available had been studied and the main system requirements had been founded. User want to know where is the position of the bus before arrive and showing bus position in a map is more meaningful instead of just showing estimated arrival time

**Design:**

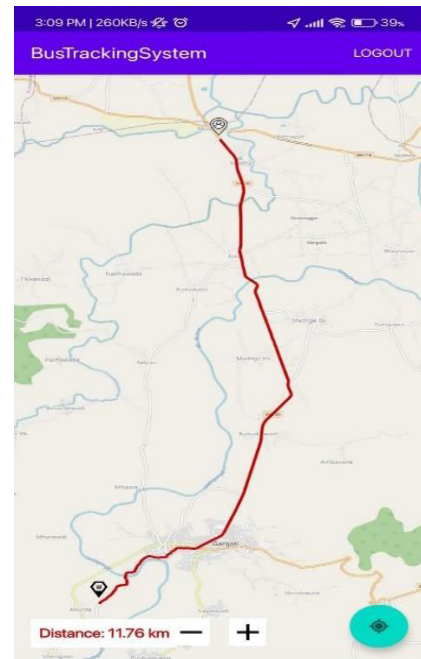
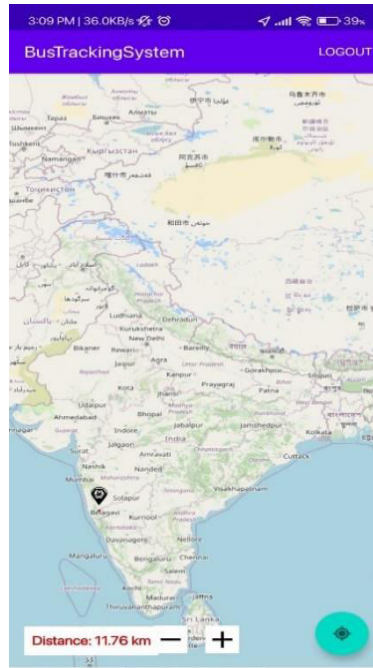
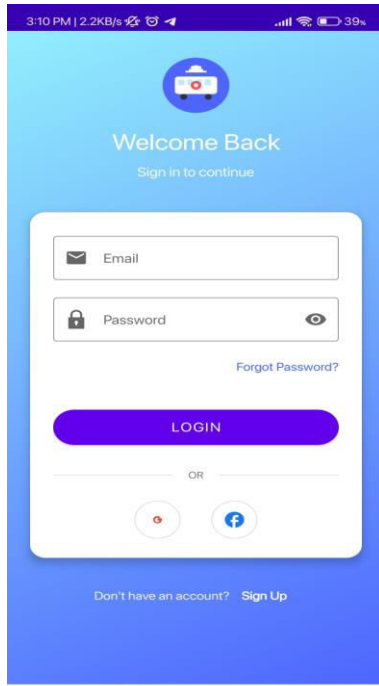
The development of proposed system is begun and functional system has to be developed in this stage. In prototyping methodology, this design stage will be the prototyping loop point and the first prototype is developed in the first loop. After the first prototype has been evaluated by user and came out with new requirements, development process will loop back to this stage. Redesign and rebuild the second prototype.

**Implementation:**

- This stage is executed when the prototype is accepted by users. When the latest version of prototype is satisfied user requirements, development process will jump out from prototyping loop. The final system will then develop based on the accepted prototype. The accepted prototype will become the fundamental of final system and the user interface of final system will be enhanced. Functionalities in the accepted prototype will fully apply into final system. After final system is developed, final testing will be performed.



### III. RESULTS



### IV. CONCLUSION

A **Bus Tracking System** enhances the efficiency, safety, and convenience of transportation in colleges and institutions. By integrating **GPS, IoT, mobile applications, and cloud computing**, the system provides **real-time tracking, estimated arrival times (ETA), and automated notifications**, reducing waiting time and improving user experience.

The estimated bus arrival time is based on the average of arrival time in every bus stop in current version of system and it is not the most accurate estimated time. Because the current system does not consider about unexpected situation happened on the road such as traffic status and bus users boarding status. In future, the system will enhance to provide more accurate estimated arrival time to user. There are many other enhancements for the proposed system, one of the important enhancement would be create an artificial intelligence program to automatically study and analysis bus route data to provide most optimum estimate arrival time. By applying artificial intelligence program, the system will become more valuable because of the accuracy of estimation on arrival time.

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Lastly, I would like to thank my family for their unwavering support and encouragement throughout the course of this project.

This project has helped me enhance my knowledge of Python, real-time tracking technologies, and user interface development, and I look forward to applying these skills in future endeavors.

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