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Real Time College Bus Tracking System(Utrack)

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ABSTRACT

Many colleges make it hard for students to find the bus, which makes them wait at bus stops for no reason. This work uses IoT technology to make a real-time bus tracking system that solves this problem. An ESP32 microcontroller and a Neo-6M GPS module work together to get location data for the system. Using Wi-Fi, the collected data is sent to a Firebase cloud database. A mobile app shows the bus's movement on a timeline, which is easier to understand than traditional map-based systems. This helps students and staff plan their trips better and cuts down on the time they have to wait. The system is easy to use, works well, and can be made even better by adding more features in the future.

1. INTRODUCTION

Transportation is not just a regular life aspect it is an integral part of daily routine, especially in schools where students and staff depend on vehicles to travel with ease. Several colleges do not have an effective solution for real-time bus tracking. As a result, the students tend to arrive at bus stops early, and wait for their buses without knowing when they will come. This is a waste of time and makes it difficult. Most of the time, buses run at fixed schedules and once in traditional systems even though these schedules could not be taken as reliable due to traffic conditions, delays, etc.If these institutions do not communicate, it will be hectic for students and staff to manage their time. The advancements in Internet of Things (IoT) technology have made it possible to build systems that enable real-time reporting. This project helps you to build a very simple and useful bus tracking application based on GPS & ESP32 technology. The system then collected location data continuously with the use of Wi-Fi and forwarded it to a cloud server. Instead of much more involved map interfaces, the system depicts bus movement on a timeline. This facilitates the understanding of what the bus is doing in this very moment.

2. EXISTING SYSTEM

The bus tracking abilities of the current college transportation system are limited. Students and staff go to bus stops at prescribed times, but these often do not coincide with the buses arrival. This results in all kinds of confusion and difficulty.

There is no comms btw the bus and users, fully based on people watching. This way students might miss the bus or wait long without any purpose. The absence of a central repository to monitor bus movements also impedes effective transport management.

Drawbacks:

- No real-time tracking of bus location
- Students and staff must wait without information
- Fixed schedule is unreliable
- No communication system between bus and users
- Poor time management

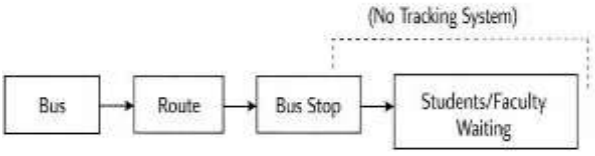
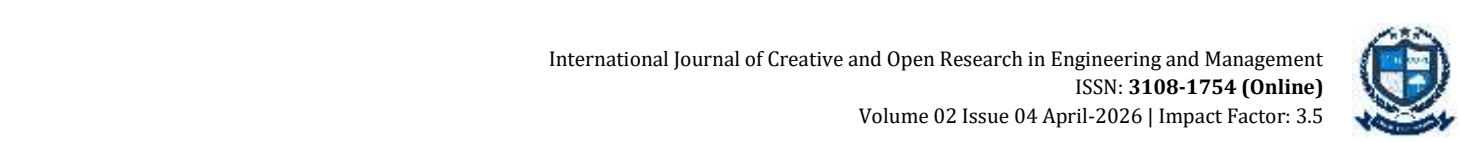


Fig.1. Block diagram of existing system

3. PROPOSED SYSTEM

The suggested system will use IoT technology to keep track of buses in real time. This system uses a Neo-6M GPS module and an ESP32 microcontroller to get location data like latitude and longitude.

Using Wi-Fi, the ESP32 processes this information and sends it to a Firebase cloud database. You can get to the stored data through a mobile app that shows the bus's movement in a timeline format. This makes it easy for people to see where the bus is and how far it has come. The system runs all the time and updates the location data on a regular basis. This lets people see where the bus is in real time and plan their trips better. The suggested system is easy to use, doesn't cost much, and would



work well in schools.

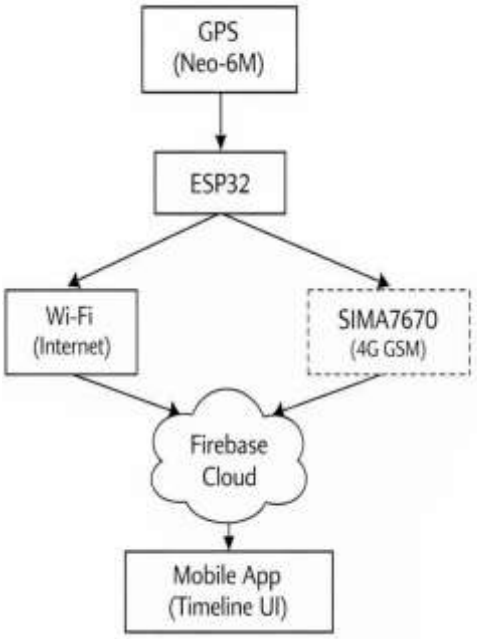


Fig.2. Block diagram of Proposed System

4. DESCRIPTION

4.1 GPS (Global Positioning System)

The GPS module tells you exactly where the bus is. It gets signals from satellites and gives you your location in terms of latitude and longitude. The ESP32 gets this data all the time and processes it. GPS is very accurate, which makes it easy to keep track of where the bus is going.

4.2 ESP32 Microcontroller

The main controller in the system is the ESP32. It gets location data from the GPS module and sends it to the Firebase server over Wi-Fi. It also takes care of the system's overall operation, such as collecting and sending data. It has built-in Wi-Fi, which makes it good for IoT-based apps.

4.3 Firebase (Cloud Database)

Firebase is applied as a cloud database to store the location data. The ESP32 updates the location data, which is then uploaded into Firebase and becomes accessible by the mobile app. Firebase supports real-time data synchronization, enabling users to access updated data instantly.

4.4 Mobile Application (Timeline Interface)

The mobile app displays the information related to the tracking of the bus. Rather than displaying the location of the bus on a map, the mobile app employs a timeline interface to visualize the movement of the bus.

5. RESULT

System testing was conducted under varied circumstances to determine its efficiency. The ESP32 managed to acquire location information from the GPS sensor and communicate it to the Firebase cloud server through Wi-Fi connectivity. The information was frequently refreshed and viewed on the mobile application instantaneously. The timeline design made it easy to visualize the movement of the bus and interpret its current state. The system operated consistently throughout and provided precise information, contributing significantly to minimizing wait times for passengers.System testing was conducted under varied circumstances to determine its efficiency. The ESP32 managed to acquire location information from the GPS sensor and communicate it to the Firebase cloud server through Wi-Fi connectivity. The information was frequently refreshed and viewed on the mobile application instantaneously. The timeline design made it easy to visualize the movement of the bus and interpret its current state. The system operated consistently throughout and provided precise information, contributing significantly to minimizing wait times for passengers.

6. CONCLUSION

A real-time bus tracking system has been created with the help of ESP32 and GPS. The system has worked efficiently in terms of collecting and sending location information.

The application of the timeline approach has simplified this process.

The bus tracking system will prove to be highly useful for students and faculty members in locating the bus without delay. It is an economical option and can be upgraded in the coming days with some additional functions.

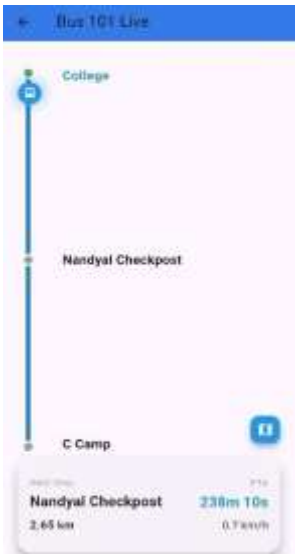


Fig.3. Real-Time Bus Tracking Interface

7. FUTURE SCOPE

For the future, some improvements that can be made in the system include enabling multiple buses in the system to enable users to follow more than one bus at once.

Notification capabilities can also be included in the system to notify users of bus arrivals and delays.

Some other possible improvements can include route analysis and monitoring the performance of the system.

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