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Campus Shuttle Tracker & Monitoring System

Vipul Patel[1], Nishant Bodare[2], Swapnil Yadav[3], Utkarsh Yadav[4], Asst. Prof. Shital Waghmare[5]
Department of Computer Science, Yashoda Technical Campus, Satara, Maharashtra

Abstract: ***The Campus Shuttle Tracker System is an innovative solution designed to enhance the commuting experience for students by providing real-time tracking of college shuttle buses. This system leverages GPS technology to deliver accurate location updates and estimated arrival times, ensuring that students can plan their travel efficiently. Additionally, the system integrates an attendance management feature, simplifying the process of logging attendance for both students and administration. By linking attendance records with shuttle usage, it provides a seamless and automated approach to tracking student participation. To support operational efficiency, it monitors fuel consumption and generates digital request forms for refuelling, helping to maintain optimal fuel management. It also collects the data for daily running of the bus from start of the day. Additionally, it includes an integrated online payment gateway for collecting bus fees, generating digital bus passes to promote a paperless and seamless process. The system incorporates RFID technology to automate student attendance during transit, ensuring accurate and tamper-proof records. It would be upcoming feature with a user-friendly interface and robust backend, the Campus Shuttle Tracker System aims to address common challenges faced in campus transportation while fostering convenience, safety, and time management for students and staff alike.***

Keywords: Smart Application for Students, Innovative Solution, Attendance Management, Seat Reservation, Message, Location, User-Friendly, Security, Time Management.

I. INTRODUCTION

Efficient transportation is a critical aspect of campus life, influencing both the academic and personal experiences of students. The Campus Shuttle Tracker System is a comprehensive solution designed to address the challenges associated with campus transportation. This system provides students with real-time tracking of college buses, enabling them to monitor their exact locations and estimated arrival times. Such functionality not only minimizes uncertainty but also enhances time management by allowing students to plan their schedules more effectively. Beyond bus tracking, the system incorporates an attendance management feature, streamlining the process of recording attendance. By integrating transportation data with attendance systems, this app offers a seamless way for both students and administrators to manage records efficiently. The incorporation of RFID technology for automated attendance tracking ensures accountability and accuracy without manual intervention. Additionally, the system includes a fuel monitoring module to track consumption patterns and generate digital refuelling requests, ensuring that shuttles are maintained efficiently and reducing downtime. A secure online payment gateway facilitates easy fee collection and automates the generation of digital bus passes, providing a paperless and convenient experience for users. Security and convenience are central to this system. By providing real-time updates and organized commuting options, the app contributes to a safer travel environment. In addition, the app's user-friendly interface ensures accessibility and ease of use for all students. The Campus Shuttle Tracker System is designed to foster a balance of security, time management, and convenience, making it an essential tool for modern campuses aiming to optimize their transportation services.

II. LITERATURE REVIEW

G. Kiran et.al introduced an android application where the hardware unit is also used along with the software unit to track college buses. The hardware unit consists of a global positioning system module and an Arduino microcontroller. The Global System for Mobile communications (GSM) is inserted to a subscriber identity module card which is connected to the power supply. Using the commands dumped into the microcontroller, it takes the latitude and longitude values of the current position from the global positioning system and passes it on to the global system for mobile communications. The global system for mobile communications will be connected to the server by general packet radio service. Thus, the values get stored in the database on the server. Then, the location is fetched from the stored database on the server. This location is transferred as a Google Map which is visible to the user. The position of the bus is refreshed every thirty seconds and stored on the server database. [1]

The authors Komal Satish Agarwal et al proposed RFID Based Intelligent Bus Management and Monitoring System. They concluded that by implementing this system various problems like underutilization of bus fleet and long waiting time at the bus stops will be reduced. It can improve the quality of the public transportation service effectively [2].

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The authors M. A. HANNAN et al, proposed the Intelligent Bus Monitoring and Management System. The experimental results show that the system is intelligent enough and able to provide important information to the authorities for monitoring and management of the bus system [3]. The authors Anuradha Vishwakarma et al, proposed GPS and RFID Based Intelligent Bus Tracking and Management System. In their proposed model they have developed AISFBRM the autonomous informative services for bus route map that is flexible, affordable, customizable and accurate [4]. The authors Shital M. Dharrao et al, recommended the Intelligent Bus stand Monitoring and Control Using Combination of GSM, GPS & IR Sensors. The proposed system provides real time information to monitor bus stand activity done by bus stand management as well as prospective passenger. Proposed system is more efficient and cost effective, it is possible to implement commercially [5].

The proposed system uses GPS tracking and ReactJS to display student attendance, estimated arrival time, and live video for safety. It also allows route and place updates in the database. The system can be accessed via a web browser or Android app, benefiting travel organizations by tracking vehicle locations. It consists of three modules: the Server module, which monitors and records bus locations; the Bus Unit module, which tracks the bus, records student attendance, and sends data to the server using RFID and GPS; and the End User Application module, providing interfaces for administrators and users. [6]

The school bus is a key mode of transportation for children, and their safety is a growing concern due to traffic accidents. Parents worry about their children's safety during the journey. Using GPS technology, the proposed system tracks the bus's location in real-time. Built with Java and Firebase, it syncs location data with registered parents, notifying them when their child reaches or passes a stop. [7]

III.PROBLEM STATEMENT

To make good use of Web and Android technology, we need a solution that works with minimal hardware. The "Web & Android-Based Attendance System" is created to improve how college bus services are managed. Many colleges still use old methods like keeping records on paper and sharing bus schedules through notices, which is not very efficient. These methods can cause problems for students. For example, students might wait for a bus without knowing it has already left, making them late for class. To solve these issues, we need a smart system that provides real-time updates about buses. The proposed system makes it easy to track bus locations and timings, giving students the information, they need right when they need it. This system helps make college transportation more convenient and reliable.

IV.MOTIVATION

In many educational institutions, the Bus Management System is still handled manually. This process is not only time-consuming but also insecure and unreliable, with a risk of data being lost. With the proposed system, all bus-related details will soon be accessible via software. Students will be able to track the bus's location and make fare payments conveniently. The main aim of this system is to create an application that enhances the safety of college and school-going children. It enables parents and school management to monitor the status of smart, secure buses using IoT technology. The system will offer several features such as speed monitoring, tracking missing children, handling accident emergencies, managing inappropriate drop-offs, a panic button, and logistics management, all aimed at improving child safety. Additionally, the system focuses on addressing current challenges in college bus management, such as identifying passengers boarding the bus, the time and location of their boarding, and ensuring better management of bus services overall.

V. SCOPE

The goal of this project is to create a simple and efficient Web & Android-based college bus management system. The initial scope is limited to the system where the software is installed, meaning it is developed as a desktop application for a specific institution. However, it can be enhanced in the future to operate online. The main purpose of developing the Attendance System app is to digitize the traditional method of obtaining bus information. Colleges, schools, or travel agencies can utilize this application to provide real-time vehicle location updates. The system includes essential features, such as adding or updating routes and locations in the database, while also significantly reducing the use of paper. This application is an Android mobile app designed primarily for school or college faculty, allowing them to access bus details conveniently on their phones.

VI. NEED

Today, the rise in crimes, including the abduction of school children, highlights the need for enhanced safety measures. Many children’s lives are at risk due to inadequate security. To ensure the safety of every child, it is essential to strengthen the protective measures around them.

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One such measure is bus surveillance. Globally, the safety of children has become a top priority for both parents and school administrations. Every parent worry about their child's well-being, so providing a safe and secure transportation system is crucial. Schools can address significant concerns such as the bus route, student attendance on the bus, and the bus's speed. Additionally, fuel usage by drivers is another factor requiring attention. The proposed system aims to enhance child safety while providing peace of mind to both parents and administrators. This project is designed to ensure every child's security and reassure parents. It offers real-time bus tracking along with emergency alert notifications in critical situations. The system facilitates real-time monitoring, efficient route planning, and a streamlined method to manage bus and student-related information. It features an intuitive interface that requires minimal training, reduces paperwork, and makes information easily accessible.

VII. DESIGN AND ANALYSIS

The chapter outlines the design and analysis used for real-time location tracking of college bus. It shows design of integration of GPS module for sending the location coordinates to the server, ensuring getting updates in real time.

A. Requirement Analysis

Identify user needs (students, staff, and admin) and list functional and non-functional requirements.

B. System Design

Design the architecture for hardware (e.g., RFID readers & GPS modules) and software integration. Develop wireframes and database schemas for the web interface.

C. Module Development

1) *GPS Tracking:* Integrate GPS modules and map APIs for live bus location.
2) *Bus Route Management:* Implement algorithms for optimal route allocation and student mapping.
3) *Fuel Efficiency and Refuelling:* Develop modules for fuel consumption tracking and refuelling requests.
4) *Online Fee Collection:* Build secure payment gateways and automate pass generation.
5) *RFID Attendance:* Configure RFID readers and integrate data processing systems for attendance logging.

D. Database Implementation

Set up servers and databases to handle real-time data, user authentication, and reporting.

E. Frontend Development

Create user-friendly interfaces for staff, students, and admins using web development tools.

F. Integration and Testing

Test individual modules and integrate them into a unified system. Conduct unit, integration, and user acceptance testing.

G. Deployment

Host the system on a reliable platform and configure hardware devices on buses.

H. Maintenance and Feedback

Monitor system performance, collect feedback, and iterate to fix issues or add features.

The system architecture diagram shows that how user can track the bus from the app itself.

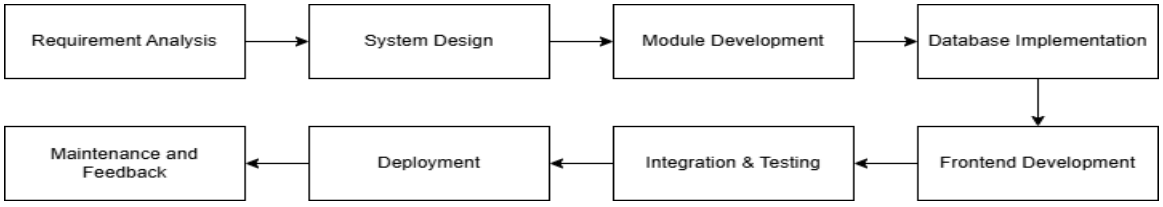


Fig. 1 Process of Project

VIII. CONCLUSION & FUTURE WORK

This project successfully integrates modern technology to streamline college bus management and enhance user convenience. By providing real-time bus location tracking, the system ensures safety and reliability for students and staff. Efficient allocation of bus routes and students reduces logistical complexities, while the fuel management module enhances operational efficiency. The integration of an online fee collection system not only simplifies payment processing but also automates pass generation, reducing manual errors. Additionally, the RFID-based attendance system offers a secure and accurate way to monitor student presence. Overall, the project addresses critical challenges in college transportation, providing a comprehensive, user-friendly solution that improves operational efficiency, safety, and accountability. It demonstrates the potential of technology to simplify and modernize traditional processes. The users suggest that the future researches may improve the current project. More features may be also added to the system through feature researches to improve and enhance the capabilities of the system. Future researches may also create application for iOS users due to which the system will be more accessible and may accommodate and support more users that use different mobile platforms.

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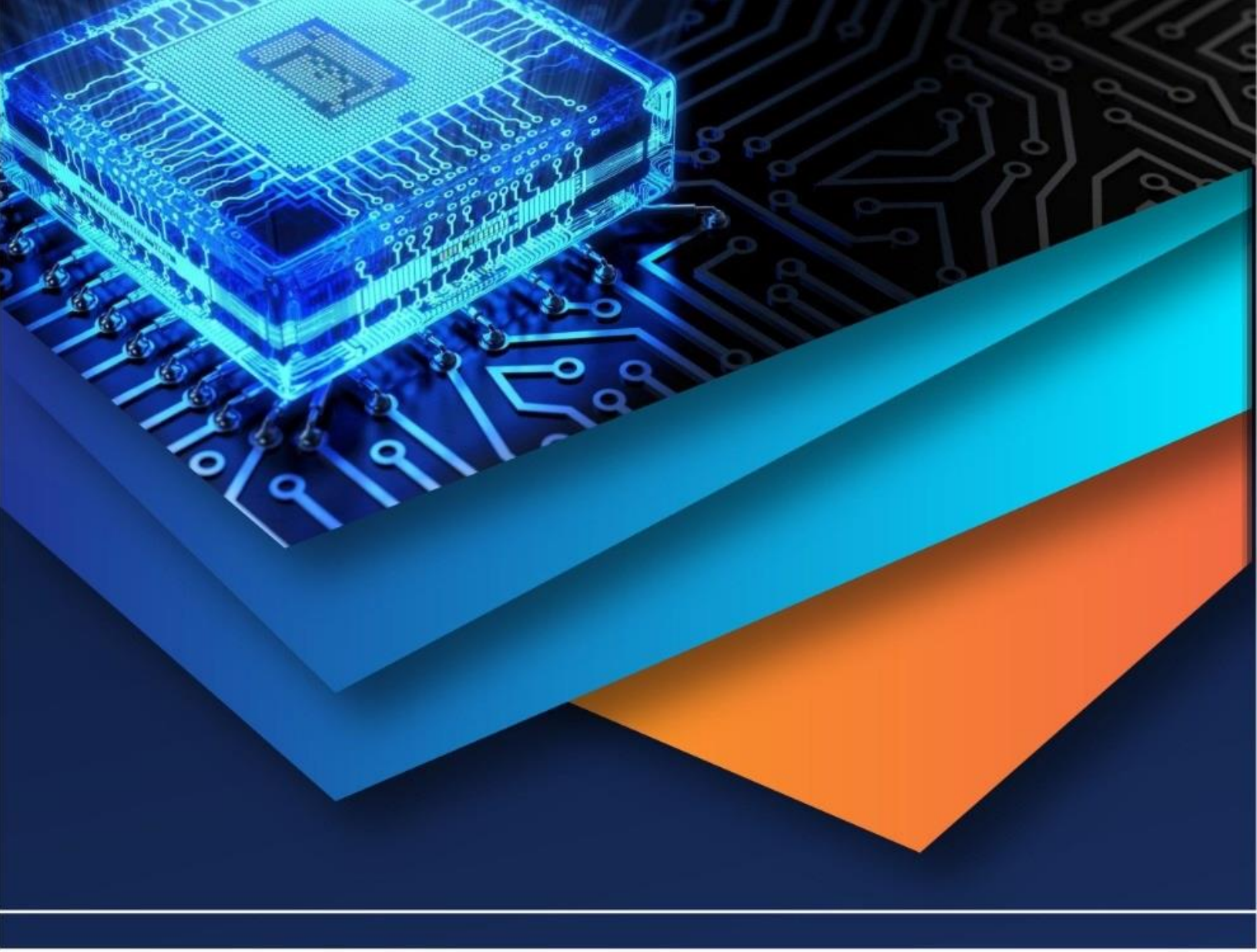
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