

RFID AND GPS INTEGRATED SMART CAMPUS TRACKING WITH DYNAMIC ETA NOTIFICATIONS

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ABSTRACT

The Campus Bus Monitoring and Smart Attendance System is an innovative solution aimed at enhancing the safety, efficiency, and management of campus transportation. It combines GPS-based real-time bus tracking, RFID-enabled student attendance monitoring, and GSM/IoT-based communication to provide accurate and timely information to students, parents, faculty, and campus administrators. Students scan RFID cards when boarding and alighting the bus, which triggers automated notifications to parents via SMS or mobile apps, ensuring real-time awareness of their ward's location. The GPS module continuously tracks bus movement, while the system dynamically calculates the Estimated Time of Arrival (ETA) based on live traffic conditions, enabling students and faculty to plan their commute efficiently. Faculty members can monitor bus routes and locations without attendance tracking. The cloud server stores attendance and location data, manages notifications, and provides a centralized admin dashboard for managing routes, buses, and schedules. By integrating real-time tracking, automated attendance alerts, parental notifications, and adaptive scheduling, this system improves operational efficiency, enhances student safety, and ensures transparent campus transportation management.

Keywords: GPS, Bus module, Tracking, Location and College Bus, Server, ETA Notification

I. INTRODUCTION

The Campus Bus Monitoring and Smart Attendance System is an advanced embedded and IoT based solution developed to improve the safety, efficiency, and management of student transportation within educational institutions. Traditional bus monitoring systems rely heavily on manual attendance recording and indirect communication methods, which often lead to inaccuracies, delays, and lack of real-time information. To overcome these limitations, the proposed system integrates an Arduino microcontroller with RFID technology, GPS tracking, GSM communication, and cloud connectivity through NodeMCU. The RFID reader automatically records student attendance during boarding and alighting, while the GPS module continuously tracks the real-time location of the bus. Using GSM communication, instant notifications are sent to parents or guardians, ensuring transparency and enhanced student safety. Additionally, data is uploaded to an IoT platform for centralized monitoring and analysis, and an LCD display provides immediate system status updates inside the vehicle. This integrated approach creates a reliable, automated, and scalable smart transportation management system suitable for modern campus environments. In this group project, we have developed a Campus Bus Monitoring and Smart Attendance System aimed at enhancing the safety, reliability, and convenience of transportation within a university campus.

To ensure student safety, each bus is equipped with an RFID attendance system. Students scan their RFID cards while boarding in the morning and again while leaving in the evening. Immediately, an automated SMS notification is sent to their parents, updating them that their ward has safely entered or exited the bus.

II. LITERATURE REVIEW

1. Title: Bus Monitoring System using Android Application

Authors: Suraj Phadatare¹, Prathamesh Kudtarkar², Jignesh Seth³, Asst. Prof. Vaishali Yeole⁴

Abstract: - In this Modern and Competitive world where everyone is worried to achieve their targets on time where people value each and every seconds to optimize their Goal. As though time is an illusion in this cosmic but it plays an ultimate role in this Money Controlled World. Being step into this highly advance Nano technology world where everything on this Planet appears to be in our Hand, where everything is been control by just one click, so why we should waste our time waiting for the travelling means. Where we can Track our Traveling means through GPS i.e. for Buses we can have the Bus Monitoring System using Android Application. In this Competitive world where Time is Money and if we waste our Money just because of traffic and waiting for the Transport means that will be very unfair for our Goals. Being lived in the Developing Country where everything is Under-construction where we are building new roads and new Projects just to make best of our time, we can't afford to lose the opportunities while waiting for our Transport Means. The main objective of our Project is to achieve our Goal on time and to Utilize each and every seconds of our life Span without wasting them at least on our Transport Means. In this article we are sharing our project ideas which can be implemented for our Public Transport which is most preferable and convenient mean of transport i.e. BUS.

2. Title: RFID Based Intelligent Bus Management and Monitoring System

Authors: Ms. Rahesha Mulla, Ms. Tayyaba Mujawar, Mr. Sumit Sutar, Mr. Rushikesh Shelke, Mr. Shivraj Hippargi

Abstract: In almost every college, they provide their bus transportation facility. Under this, updating & maintaining daily bus records such as bus km, timing, driver and bus details. This every day activity is time consuming & there is chance of manual mistakes /interference. Paper presented here describes a system that intended to overcome the flaws in the existing system & bring out accuracy, safety of records. Proposed system uses GPS & map API for the student, staff to track the bus. Additionally, biometric attendance can be recorded. From the online recorded data on central college server, admin can generate essential report.

3. Title: Intelligent Campus Transport Management System

Authors: R. V. Viswanathan , A. Harini , N. Yoga Preethi , S. Shalini

Abstract: The "Intelligent Campus Transport Management System" enhances campus mobility through an integrated Android app and website, catering to four user roles: administrator, student, faculty, and driver. Administrators manage comprehensive data for buses, students, faculty, and drivers. Students access real-time bus tracking, submit personal details, and report grievances.

Faculty utilize the platform for similar bus tracking and grievance submission. Critically, for sensitive inquiries, the system facilitates escalation to the bus manager for personalized attention. Leveraging Wi-Fi API modules in buses, the central control unit collects real-time location data, updating the central database. This data, combined with user-provided information, empowers the system to provide accurate, up-to-the-minute transit information. The system improves communication, streamlines issue resolution through the grievance mechanism, and ultimately enhances the campus transportation experience by providing transparency and responsiveness.

III. PROPOSED METHOD

The proposed Campus Bus Monitoring and Smart Attendance System introduces an embedded based solution that automates attendance tracking and real-time bus monitoring. Using an Arduino microcontroller integrated with an RFID reader, GPS module, GSM module, NodeMCU, and LCD, the system registers students as they board and alight, continuously tracks bus location, and sends SMS notifications to parents or guardians. Data is simultaneously uploaded to the cloud for centralized monitoring and analysis. This model enhances safety, efficiency, and accountability, while providing a scalable framework for smart campus transportation management. The block diagram represents the complete workflow and interaction of components in the Campus Bus Monitoring and Smart Attendance System. The system starts with students carrying RFID tags, which are scanned when they board or exit the bus. The GPS module continuously tracks the bus location, while all data is processed by a microcontroller or NodeMCU. The processed data is transmitted via GSM or Wi-Fi to the cloud server, where it is stored, analyzed, and used to calculate the bus's ETA.

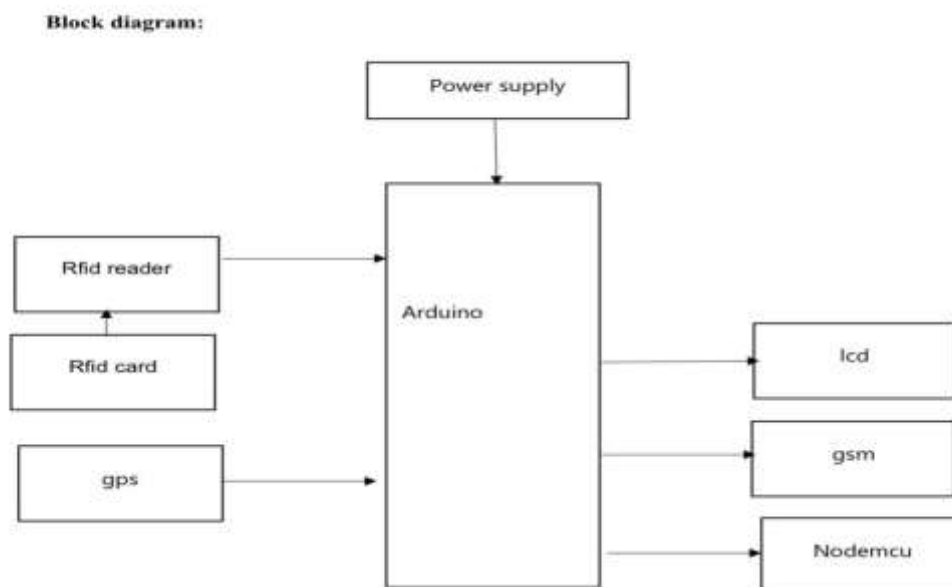
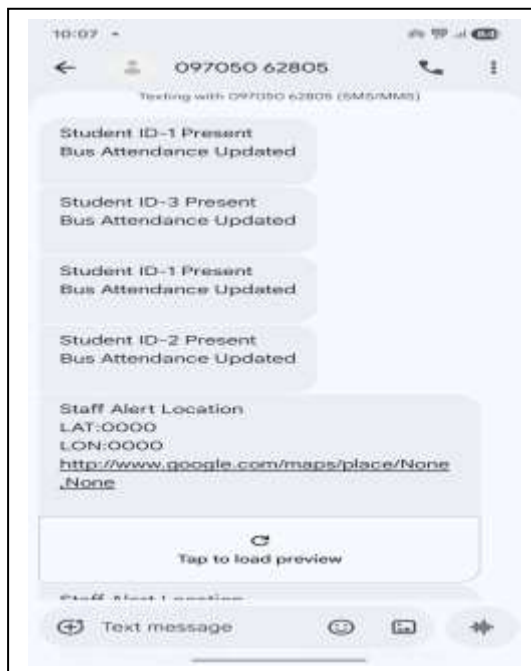
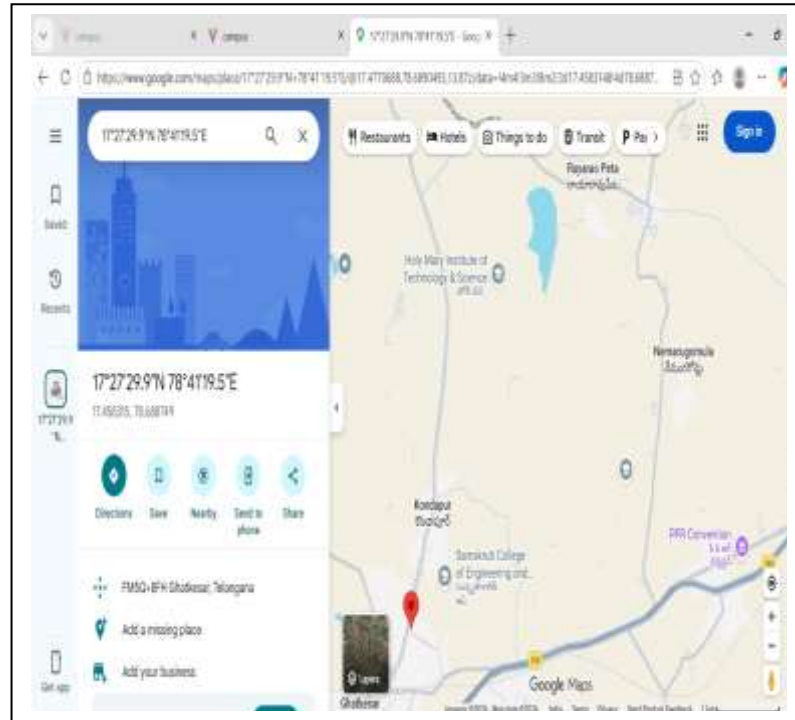


Fig 1: Circuit diagram of Campus Bus Monitoring and Smart Attendance System

V. RESULTS



The system uses a GPS module to continuously track the bus's location by capturing its latitude and longitude. This information is processed by an Arduino UNO microcontroller, which also displays the current location on an LCD screen for local viewing. To allow remote monitoring, a NodeMCU (ESP8266) sends the live location data to the ThingSpeak IoT server through Wi-Fi. The entire system is powered by a 12V battery to ensure it operates smoothly while the bus is in transit. Students and faculty can then view the bus's live location through a custom application, which provides real-time updates and notifications about upcoming stops. Overall, this system improves safety, saves time, and makes campus transportation more transparent and efficient.

VII. CONCLUSION

The Campus Bus Monitoring and Smart Attendance System successfully demonstrates an intelligent and automated approach to managing student transportation using embedded and IoT technologies. By integrating RFID-based attendance, GPS location tracking, GSM communication, and cloud connectivity, the system ensures accurate monitoring of students and real-time tracking of campus buses. The automation of attendance eliminates manual errors, while instant notifications enhance communication between institutions and parents, improving overall student safety and accountability. The implementation of centralized data monitoring enables efficient transport management and future data analysis. This system provides a reliable, scalable, and cost-effective solution that can be further expanded with advanced smart city and intelligent transportation applications, making it highly suitable for modern educational environments.

VII. FUTURE SCOPE

The future scope of the smart campus bus monitoring system can be significantly enhanced by integrating advanced technologies like Artificial Intelligence and IoT. AI-based ETA prediction can improve the accuracy of arrival times by analyzing historical travel patterns along with real-time traffic data, making the system more reliable for users. Additionally, replacing traditional RFID cards with face recognition technology can enable automatic attendance, enhancing both convenience and security. An emergency alert system can also be incorporated, allowing passengers or drivers to quickly notify authorities and parents during accidents or unsafe situations. Furthermore, expanding IoT capabilities by adding sensors to monitor fuel levels, engine health, and driver behavior can help in efficient vehicle maintenance, reduce operational costs, and ensure overall safety and performance of the transportation system.

VIII. REFERENCES

- [1] Campbell, M., "The impact of the mobile phone on young people's social life," Social Change in the 21 Century 2005 Conference Proceedings. Queensland University of Technology, Australia, pp. 1-14, 2005.
- [2] Michael M. and Laura R., "meCUE – Ein modularer Fragebogen zur Erfassung des Nutzungserlebens," In: S. Boll, S. Maaß & R. Malaka (Hrsg.): Mensch und Computer 2013, pp: 89-98. 2013.
- [3] Evans D., "The Internet of Things: How the Next Evolution of the Internet Is Changing Everything," CISCO white paper, pp: 1-11, 2011.
- [4] B. Dorsemayne, J. Gaulier, J. Wary, N. Kheir and P. Urien, "Internet of Things: A Definition & Taxonomy," 2015 9th International Conference on Next Generation Mobile Applications, Services and Technologies, 2015, pp. 72-77, doi: 10.1109/NGMAST.2015.71.
- [5] Bilal K., "Smart Campus: Benefits, Trends and Technology–Part 1," wrld, 2019. [Online]. Available: <https://www.wrld3d.com/blog/smart-campus-trends/>. Accessed on [09/07/2020]