Safe Track the Safe College Bus Tracker

Dharani P[1], Amrutha Lakshmi S R[2], Akshaya S R[3], A Thilagavathy[4], Ms Latha J[5]

1,2,3,4,5Department of Computer Science and Engineering.R M K Engineering College, Kavaraipettai, Tiruvallur, Tamil Nadu

Abstract—Day Scholar students frequently experience the aggravation of missing buses due to a lack of knowledge regarding bus schedules, pick-up sites, and real-time bus locations, we suggest installing a college bus tracker system as a solution to these issues. Every bus in this system has a GPS tracking device installed, which sends real-time information about the positions, speeds, and routes of the buses to a central database. This data, which is available via an easy-to-use mobile application or web platform, provides essential information to college officials, students, and their families. Apart from improving the security and comfort of student transportation, the college bus tracker also guarantees effective routing, which minimizes travel times. This technology seeks to improve college bus operations and provide peace of mind by tackling the problem of missed buses and enabling real-time monitoring.

Index Terms—Bus Tracking Technology, GPS-Bus Tracking, Mobile Application, Real-time tracking, IOT Integration, Efficiency Enhancement

I INTRODUCTION

In a time of rapid technology advancement, public transportation system optimization has become a top priority for transportation authorities and urban planners globally. A rising set of research and development initiatives using state-of-the-art technology has evolved to solve the problems of crammed buses, erratic scheduling, and annoyance to passengers. Mobile apps and GPS-based bus tracking systems have drawn a lot of interest among these developments. This study examines previous research in this field, emphasizing the use of real-time tracking capabilities, cloud-based systems, and GPS technology to improve transportation efficiency and user experience. They provide precise arrival time estimates and meet the various needs of passengers, such as parents of school-age children and college students, by combining IoT solutions with location sensors. An overview of the diverse array of technologically based solutions that are transforming transportation in the future is given in this introduction.

II.RELATED WORK

A smart method [1] was suggested to deal with the problems caused by crowded public transportation. It tracks the location of the bus using GPS modules and makes real-time bus location data available to remote users over the cloud. The usage of web, iOS, and Android platforms in the tracking application was covered in [2]. Students can use this program to use Google Maps to track their location. It offers up-to-date details about the bus, including its route, stops, driver information, and contact numbers. Given that it offers more information, this application appears to be effective for the users. The approach that gives the precise location of the bus simply in the form of latitude and longitude coordinates was proposed [3]. If Google Maps or Map API be used to track the location, that will work better. The Android mobile application integrates with online bus tracking systems [4] and uses Google Maps API for real-time location updates. The system which aims to improve the public transportations [5].It has the possibility of estimating bus crowdedness and the users can view the current location of the desired bus. The mobile application through that the user can track the current location of the DTC buses [6] it mainly aims to address the issue of waiting for buses without prior information and provide passengers with real-time updates. The system which utilizes GPS trackers and IoT people counters for real-time bus tracking [7]. It offers estimated arrival times and passenger count and it allows the student to provide feedback and file complaints. The system which uses position sensors for navigating the public transports [8]. The main goal of the system is to reduce traffic congestion and promote environmental sustainability. The idea of proposing a system [9] which utilizes RFID, GPS, and GSM technologies for real-time monitoring of school transportation. It provides notifications to parents when children board

the bus. It assists school administration in ensuring student safety and handling emergencies.

In the all above mentioned works, the location of the bus can be tracked easily and the same can be intimated to the passengers. Few works deal with the over crowd estimation process to prevent user from taking that route. The alert generation and attendance management are discussed in few papers only. In order to incorporate these additional features, we are going for this Android Application based "Safe Track- The Safe College Bus Tracker". These projects and research papers collectively focus on leveraging technology to make public transportation systems more efficient, convenient, and safe for users, whether for college students, the general public, or schoolchildren. They highlight the potential of GPS, mobile apps, and other technologies to address the challenges of overcrowding and improve the overall experience of using public transit.
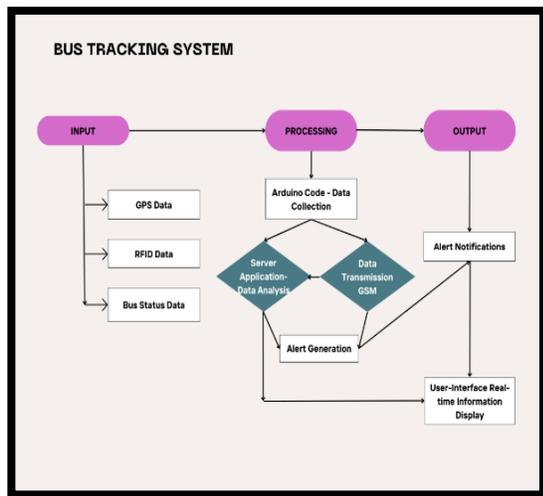
III.PROPOSED WORK

Fig 1: Work Flow Diagram

Our proposed work aims to improve tracking and identification on buses by incorporating cutting-edge technologies into the current system. The GPS and GSM chips that are installed in every bus are essential parts that provide dependable and reasonably priced real-time tracking. RFID modules will also be used to effectively manage student attendance.

This system makes use of state-of-the-art components, such as the ESP32 camera module, LM358 operational amplifier, GPS module (VK 6M GPS Module), Arduino board, GPS module (EM18 RFID Module), and GSM SIM800L.
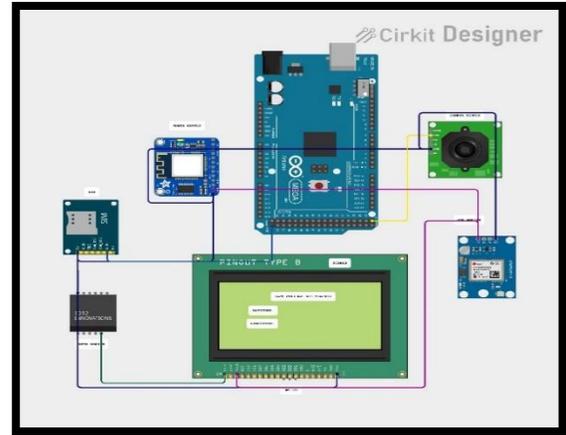

Fig 2: Workflow of the Hardware components

The bus itself can manage attendance of pupils thanks to these RFID devices. The GSM-SIM800 module and the AT Mega 2560, popularly known as an Arduino Board, are used to periodically transfer the data gathered from the GPS and RFID modules to a central server. The vital responsibility of analysing this incoming data falls to the server.

Additionally, the system in question has an alarm generation mechanism that improves communication and safety. For example, an alert is sent to the student's parents as soon as the student enters a bus and their attendance is recorded. Furthermore, notifications have been sent off and sent to parents and students in the event of unanticipated events that occur during the bus's operating hours, including traffic jams or breakdowns, informing them that their specific bus is temporarily unavailable.
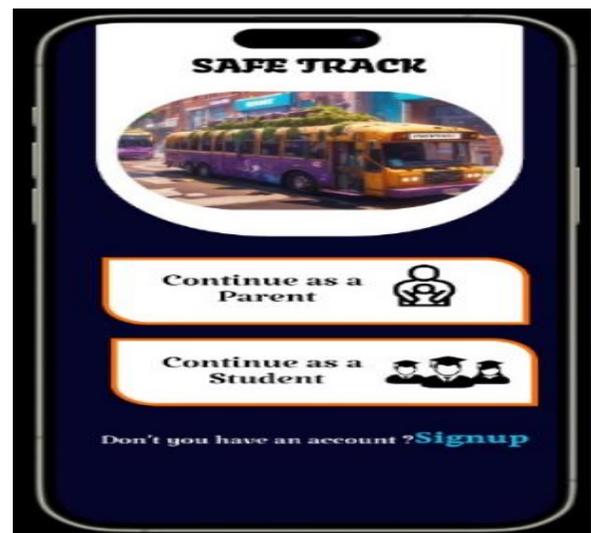

Fig 3: User Interface of Safe Track

Additionally, a user-friendly interface is used to continuously calculate and present real-time information about the buses. This contains information about the number of passengers currently on board as well as bus numbers, routes, and speeds. It also offers predicted arrival timings. In addition to guaranteeing effective college bus management, our system places a high priority on safety and communication while giving all parties concerned access to useful real-time data.

In parallel, the system provides parents with an easy-to-use online interface for tracking the bus by updating a central site with the location of the bus and other data. In addition, the platform keeps track of students, giving parents access to information such names, the date, and the time of bus arrival and departure.

Fig 4: User Interface of Parent's Profile

Fig 5: User Interface of Student's Profile

Additionally, the system uses RFID technology, which makes it possible to track and identify the pupils getting on and off the bus and location of the bus.
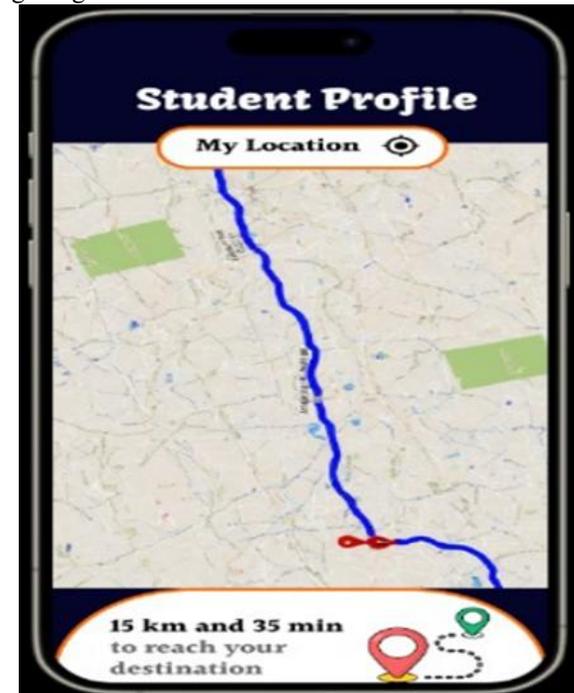
Alert Generation Mechanism: In the field of bus monitoring, our work is unique since we present a unique alarm mechanism. When pupils board the bus, the system promptly notifies parents. It works flawlessly. In addition, it reacts to unanticipated occurrences like traffic bottlenecks or malfunctions, guaranteeing that parents are notified as soon as there are any interruptions to the bus service.

Our alert system is distinct because of its event-driven methodology, which allows it to adjust to different situations while improving communication and guaranteeing student safety. This creative technique emphasizes responsive and proactive communication for an unmatched level of student security, going above and beyond traditional monitoring systems.

In this research, we present a specific alert generation system intended to efficiently handle emergency scenarios. Our technology instantly sets off emergency notifications in the event of unanticipated events, such accidents or serious occurrences. These notifications are unique in that they contact parents, authorities, and school officials right away, among other concerned parties. This special feature gives pupils an extra degree of safety by guaranteeing prompt reaction and coordination in case of crises. Our article stands out in the field of school bus monitoring systems because of its emphasis on customized alarm mechanisms, which show a proactive commitment to student welfare.

Fig 6.1 Student boarded the bus with the bus stop details
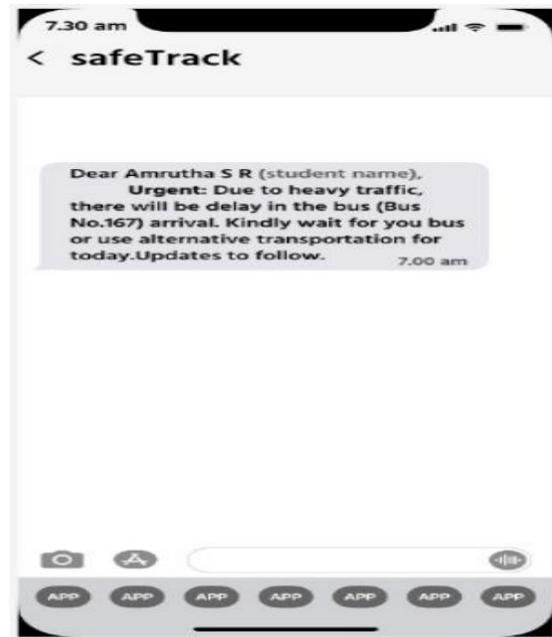

Fig 6.2 Student dropped on the bus stop

Fig 7: Special alert mechanisms for emergency

IV.CONCLUSION

In this study, we provide a novel approach to college bus surveillance by combining RFID, GSM, and GPS. Our system is unique in that it has a unique emergency alert production mechanism that guarantees prompt communication in case of emergencies. Our technology, with its effective deployment and user-friendly interface, represents a major step forward in college bus administration. Optimization and predictive analytics may be the main topics of future research. This document outlines our dedication to cutting-edge, effective, and safe college bus transportation systems.

V.FUTURE ENHANCEMENTS

The functionality, effectiveness, and user experience of the student attendance and bus tracking system can all be enhanced in the future. Here are a few possible improvements:

1.Advanced Analytics: To offer insights into bus performance, student attendance trends, and route optimization, we might install more advanced analytics as a fundamental functional necessity.

2.Real-time Communication: To improve communication between children, parents, and the transportation department, particularly in an emergency, we can also integrate two-way texting or chat capability.

3.Predictive Maintenance: Implementing predictive maintenance algorithms to anticipate bus difficulties and schedule maintenance before failures occur.

4.Biometric identity: For improved security and precise attendance tracking, RFID systems should be upgraded with biometric identity (such as fingerprint or facial recognition).

5.Voice Assistants: - Including voice commands to get bus information and warnings through voice assistants (like Google Assistant or Amazon Alexa).

6.System Integration: By integrating the system with databases, it is possible to track academic success and automatically record class attendance.

7.Geo-Fencing: This technique is used to set up boundaries for buses and send out alerts when they stray from the approved routes.

8.Enhanced Security amenities: Adding amenities like panic buttons in buses for emergency circumstances and video systems for enhanced security.

9.Machine Learning for Routing: By optimizing bus routes based on historical data, machine learning algorithms save down on fuel and trip time.

10.Sustainability Features: Including environmentally beneficial elements to cut down on energy and emissions, such as telematics or electric buses.

These improvements can make the student attendance and bus monitoring system more reliable, easy to use, and responsive to evolving requirements and technological breakthroughs. During the system's development, security, efficiency, and user experience must be given top priority.

REFERENCES

[1] Mr. Suryaprakash S[1], Irbesartan R[2], Dhanush S[3], Manthiramoorthy M[4,] Volume: 09 Issue: 06 | June 2022, "BUS TRACKING SYSTEM", International Research Journal of Engineering and Technology (IRJET)

[2] Ashish Team, Prof. Suwarna Harare, Dipak Thakre, Rahul Gaikwad, Darshana Ahau, © 2017 IJSRCSEIT | Volume 2 | Issue "HYBRID APPLICATION FOR COLLEGE BUS TRACKING SYSTEM", International Journal of Scientific Research in Computer Science, Engineering and Information Technology.

[3] Daivshila R. Jagtap[1], Gitanjali S. Borate[2], Sarika D. Kute[3], Varsha R. Jagtap[4], Mayur A. Doifode[5], Mr. Prasad P. Pratape[6], April 2019 Volume 5 Issue 11, "COLLEGE BUS TRACKING SYSTEM", International Journal of Innovative Research in Technology.

[4] Navya Sree[1], C. Mounika[1], T. Mamatha[1], B. Sreekanth[1], N. Diwakar[1], Noor Mohammed[2], 17-06-2021, "Integrated College Bus Tracking System", International Journal of Scientific Research in Science and Technology.

[5] Ashish Sonar, Sanket Patil, Sushil Unrude, Swapnil Sandhan, Volume 2, Issue 1, May 2022, "College Bus Tracking System", International Journal of Advanced Research in Science, Communication and Technology (IJARSCT).

[6] Prithvi Raju Kunder, Neha Maruti Nayak, Disha Santosh Pandey, Reena Somani, 2019, "The Real-Time Bus Tracking System", International Journal of Scientific Research in Science, Engineering and Technology.

[7] Md Shoeb[1], Jawed Ahmed[2,] Volume: 04 Issue: 04 | Apr -2017, "TRACKING OF DTC BUS USING GPS AND ANDROID", International Research Journal of Engineering and Technology (IRJET).

[8] Arun S, Shibu J, Vennila S, Kalaiselvi T. Mugundhan V, 2019, "College bus tracking

system", International Journal of Advance Research, Ideas and Innovations in Technology.

[9] Mr. Pradip Suresh Mane[1], Prof. Vaishali Khairnar[2], Mar-Apr. 2014, "Analysis of Bus Tracking System Using Gaps on Smart Phones", IOSR Journal of Computer Engineering (IOSR-JCE).

[10] Engr. Fatima Muhammad Saleem[1], Osamah Rehman Khan[2], Aliza Fatima[3], Areeba Shahid[4], Iqra Javed[5,] April, 2021, "Smart School Bus: Tracking & Management System", International +Electrical Engineering Conference.

[11] Iman M. Almomani, Nour Y. Alkhalil, Ena's M. Ahmad, Rania M. Jode., "Ubiquitous GPS vehicle tracking and management system.", 2011 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT),

[12] Branimir Skugor, Josko Deur, "City Bus Mass Estimation based on GPS and CAN-Collected Tracking Data ",2020 International Conference on Smart Systems and Technologies (SST).

[13] Ali Mustafa, Mohammed I.A al-Nouman, Osama A. Awad, "A Smart real-time tracking system using GSM/GPRS technologies.", IEEE 2019 First International Conference of Computer and Applied Sciences (CAS).

[14] Branimir Skugor, Josko Deur, "City Bus Mass Estimation based on GPS and CAN-Collected Tracking Data ",2020 International Conference on Smart Systems and Technologies (SST).

[15] Kumar G, Arun B, Divya S, "A Proficient Model for Vehicular Tracking Using GPS Tracking System.", IEEE 2019 3rd International Conference on Trends in Electronics and Informatics. (ICOEI). Tirunelveli, India (2019.4.23-2019.4.25)].