



Access Online



Article DOI:

10.5281/zenodo.21372103

¹ Professor, Dept of
ECE, Guru Nanak Dev
Engineering College,
Bidar, India

² UG students, Dept of
ECE, Guru Nanak Dev
Engineering College,
Bidar, India

How to Cite:

Dr. M. D. Bakhar,
Aditya Ghawane,
Pravin Navi,
Rajshekhhar Mainak
& Saikumar Pawar
(2026), College Bus
Tracking System with
Accident Monitoring
System, International
Educational Journal of
Science & Engineering
(IEJSE), Vol: 9, Special
Issue, May 2026
70-73

COLLEGE BUS TRACKING SYSTEM WITH ACCIDENT MONITORING SYSTEM

Dr. M. D. Bakhar¹, Aditya Ghawane², Pravin Navi², Rajshekhhar Mainak², Saikumar Pawar²

ABSTRACT

Efficient and secure transportation plays a crucial role in managing college operations and ensuring student safety. This paper presents a College Bus Tracking System integrated with safety management, accident monitoring, and theft control. The system uses real-time GSM and GPS technologies to provide accurate live tracking of buses. Students, parents, and administrators can monitor bus locations through user-friendly mobile or web interfaces. Safety features such as geofencing help prevent unauthorized route deviations and improve overall control. Emergency alert systems and real-time notifications enhance passenger security and response efficiency. The accident monitoring module detects collisions and unsafe driving behaviors using onboard sensors. Instant alerts are generated to enable quick emergency response and reduce risks. Additionally, theft prevention mechanisms like immobilizers and tracking ensure vehicle security, improving reliability and operational efficiency.

KEYWORDS: Internet of Things (IoT), Machine Learning, Smart Agriculture, Crop Protection, Animal Intrusion Detection, Rainwater Management, Soil Moisture Monitoring

1. INTRODUCTION

Transportation safety and efficiency are critical components of campus infrastructure in modern educational institutions. With the increasing number of students relying on college buses for daily commutes, it becomes imperative to ensure that these transportation systems are not only punctual and well-managed but also equipped with mechanisms to handle emergencies and accidents. Traditional bus management systems often lack real-time visibility, making it difficult for administrators and parents to track buses, respond to delays, or act swiftly in case of accidents. This gap in safety and communication has led to the need for a smarter, technology-driven solution. The College Bus Tracking System with Accident Monitoring is designed to address these challenges by integrating GPS-based location tracking with IoT-enabled accident detection and

GSM-based alerting mechanisms. This system provides real-time updates on bus location, monitors for collisions or hazardous conditions, and sends instant notifications to relevant stakeholders. By combining hardware components such as GPS modules, accelerometers, fire and gas sensors with software interfaces like mobile apps and cloud dashboards, the system ensures a comprehensive and responsive transportation management solution. This project aims to enhance student safety, improve operational transparency, and foster trust among parents, students, and college authorities.

This project aims to provide a reliable and efficient transport management system by combining tracking and safety features, ensuring better security and peace of mind for students and their families.

2. LITRATURE SURVEY

“College bus tracking system with accident monitoring system” Authors: P. Verma and J. Bhatia (2013) [1] This study presents a vehicle tracking system using GPS and GSM technologies to provide real-time location updates. It improves monitoring and management of transportation systems by allowing users to track vehicles remotely.

“IoT-Based Smart Bus Tracking System” Authors: S. K. Sood, S. V. Khatri, and K. Singh (2017) [2] The authors proposed an IoT-based system that integrates cloud computing and mobile applications to track buses in real time, improving communication and reducing waiting time for passengers.

“GPS-Based Vehicle Tracking and Navigation System” Authors: M. A. Quddus, W. Y. Ochieng, and R. B. Noland (2007) [3] This research focuses on the effectiveness of GPS technology in vehicle tracking and navigation, highlighting its role in improving route accuracy and reducing delays.

“Accident Detection and Alert System Using Sensors” Authors: R. K. Megalingam, R. Nair, and

S. M. Prakhya (2010) [4] This paper discusses an accident detection system using vibration sensors and GPS modules that automatically sends emergency alerts with location details to predefined contacts.

“Smartphone-Based Accident Detection System” Authors: C. Thompson, J. White, B. Dougherty, A. Albright, and D. C. Schmidt (2010) [5] The study introduces a system that uses smartphone sensors to detect accidents and notify emergency services instantly, enhancing response time.

3. EXISTING SYSTEM

The existing system for college transportation mainly relies on manual management and basic tracking methods. In many colleges, students depend on fixed bus schedules without real-time location updates, which often leads to uncertainty and increased waiting time. Although some systems use GPS technology to track buses, they are limited to location monitoring only and do not provide additional safety features. In case of an accident, information is usually communicated manually by

the driver or passengers, causing delays in emergency response. Moreover, there is no proper integration with emergency services, making it difficult to provide immediate assistance. Overall, the existing system lacks efficiency, real-time communication, and advanced safety mechanisms such as automatic accident detection and alert systems.

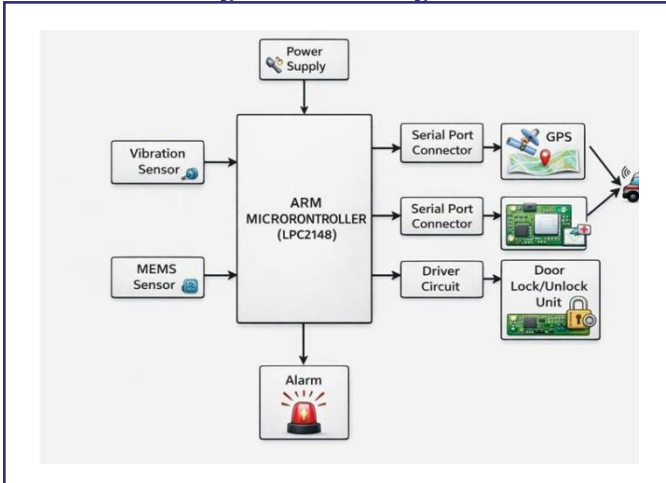
4. PROPOSED SYSTEM

The proposed system introduces a smart and integrated solution for college transportation by combining real-time bus tracking with accident monitoring features. It utilizes GPS (Global Positioning System) to continuously track the location of the bus and display it to students, parents, and college authorities through a mobile or web application. This helps in reducing waiting time and improving communication.

In addition, the system incorporates accident detection using sensors such as accelerometers and vibration sensors to identify sudden impacts or abnormal movements. When an accident is detected, the system automatically sends alert messages along with the exact location of the bus to emergency contacts, college management, and nearby hospitals for immediate assistance.

5. METHODLOGY

The proposed system is developed using a combination of GPS, IoT, and sensor technologies to ensure real-time tracking and accident detection. The methodology begins with installing a GPS module in the college bus to continuously capture the location coordinates (latitude and longitude). This data is transmitted to a central server or cloud platform using a communication module such as GSM or Wi-Fi.

Fig. 1: Block Diagram

An embedded system (such as a microcontroller) is used to process data from sensors like accelerometers and vibration sensors, which monitor sudden changes in motion or impact. If the sensor values exceed a predefined threshold, the system identifies it as a potential accident. Immediately, an alert message containing the bus location is sent to registered contacts, college authorities, and emergency services.

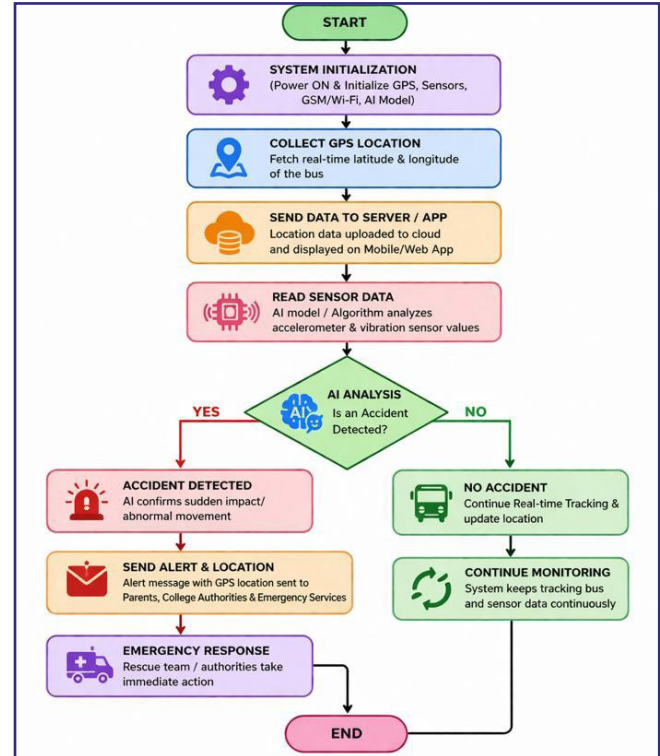
The collected data is also displayed on a mobile or web application, allowing users to track the bus in real time. The system continuously updates location and status information, ensuring effective monitoring. Overall, the methodology focuses on integrating hardware and software components to provide accurate tracking, quick accident detection, and timely communication for enhanced safety and efficiency.

6. WORKING

The working of the College Bus Tracking System with Accident Monitoring System begins when the system is powered on and all modules such as GPS, sensors, and communication units are initialized. The GPS module continuously collects the real-time location of the bus and sends this data to the microcontroller. The microcontroller processes the data and transmits it to a cloud server or application using GSM or Wi-Fi, allowing users to track the bus location.

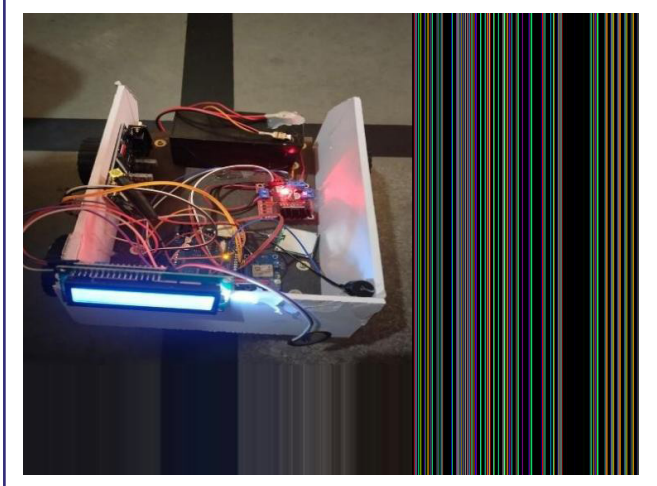
At the same time, sensors like accelerometers and vibration sensors continuously monitor the movement of the bus. If any abnormal condition or sudden impact is detected beyond a set threshold, the

system identifies it as an accident. Immediately, an alert message along with the GPS location is sent to emergency contacts, college authorities, and nearby hospitals. If no accident is detected, the system continues normal tracking and monitoring.

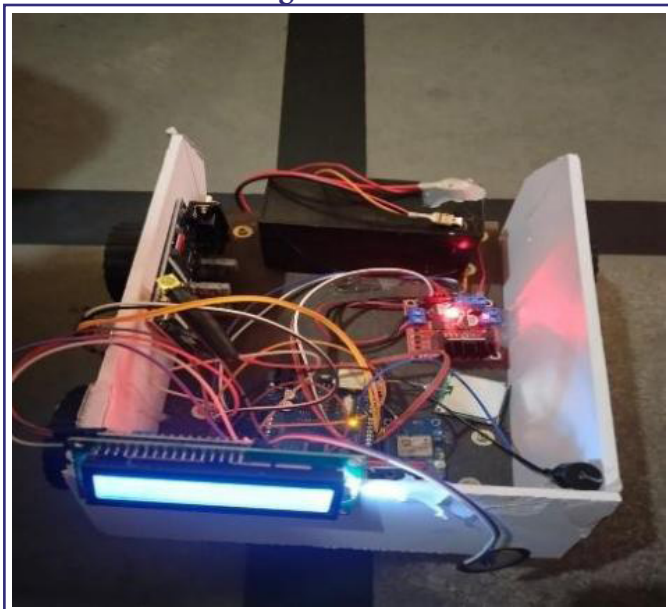


7. RESULTS AND CONCLUSION

The implementation of the College Bus Tracking System with Accident Monitoring System shows that real-time tracking and automated accident detection significantly improve the safety and efficiency of college transportation. The system successfully provides accurate bus location updates to users through a mobile or web application, reducing waiting time and improving communication between students, parents, and college authorities. The accident detection module effectively identifies abnormal conditions and sends instant alerts with location details, ensuring quick emergency response and minimizing risks.

Fig. 2: Complete Working Model

In conclusion, the proposed system proves to be a reliable and efficient solution for modern transportation management. By integrating GPS tracking with sensor-based accident detection and AI analysis, it enhances student safety, ensures timely communication, and provides better control over transport operations. This system can be further improved by adding advanced features such as live video monitoring and predictive maintenance, making it a scalable and future-ready solution.

Fig. 3: Model

8. CONCLUSION

The College Bus Tracking System with Accident Monitoring System provides an effective solution to improve the safety and efficiency of college transportation. By integrating GPS-based real-time

tracking with sensor-based accident detection, the system ensures continuous monitoring of buses and quick response during emergencies. It reduces uncertainty in bus arrival times and enhances communication between students, parents, and college authorities. Overall, the system increases reliability, ensures student safety, and represents a smart and modern approach to transportation management.

REFERENCES

1. P. Verma and J. Bhatia, (2013) "Design and Development of GPS-GSM Based Vehicle Tracking System," International Journal of Computer Science and Engineering.
2. S. K. Sood, S. V. Khatri, and K. Singh, (2017) "IoT-Based Smart Bus Tracking System," International Journal of Advanced Research in Computer Science
3. M. A. Quddus, W. Y. Ochieng, and R. B. Noland (2007) "Current Map-Matching Algorithms for Transport Applications," Transportation Research
4. R. K. Megalingam, R. Nair, and S. M. Prakhya (2010) "Wireless Vehicular Accident Detection and Reporting System," International Conference on Mechanical and Electrical Technology
5. C. Thompson, J. White, B. Dougherty, A. Albright, and D. C. Schmidt (2010) "Using Smartphones to Detect Car Accidents and Provide Situational Awareness to Emergency Responders,"
6. K. Shaik, S. S. Kumar, and K. Ramesh, (2019) "IoT-Based Accident Detection and Alert System," International Journal of Innovative Research in Technology,
7. H. Song, D. Rawat, S. Jeschke, and C. (2017) "Brecher, Cyber-Physical Systems: Foundations, Principles and Applications, Academic Press".
8. V. Gazis, (2017) "A Survey of Standards for Machine-to-Machine and the Internet of Things," IEEE Communications Surveys & Tutorials.
9. S. R. Reddy and B. S. Rao (2015) "S. R. Reddy and B. S. Rao", International Journal of Engineering Research & Technology (IJERT).
10. A. B. M. Sultan Mahmud, F. A. M. Hossain, and M. A. Rahman, (2018) "Smart Vehicle Accident Detection and Notification System Using IoT," International Journal of Engineering and Advanced Technology