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# IOT Monitoring Smart School Bus

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***Abstract:*** ***The IOT-based school bus tracking and monitoring system which uses a GPS for tracking and monitoring school buses in real-time. The system provides an easy-to-use interface for students, parents, and school administrators to monitor the location of the school bus, the number of students on the bus, and their safety. It also provides the ability to send out automated alerts if the bus deviates from its defined route. In addition, the system can be integrated with other existing school management systems for better tracking and monitoring. By providing an efficient and reliable tracking and monitoring system, the proposed system can help to improve student safety and reduce the workload of school administrators.***
***Keywords: IOT, GPS, Wi-Fi, School Bus Tracking, Monitoring, Alerts, School Management System.***

## I. INTRODUCTION

The School bus transportation is a vital part of the education system, providing safe and reliable transportation for students to and from school. However, monitoring and tracking school buses can be a challenging task due to the large number of buses, their routes, and the safety of the students. Therefore, it is important to have an efficient system for tracking and monitoring school buses in real-time.

The proposed system uses an IOT-based approach to track and monitor school buses. It incorporates a combination of GPS and Wi-Fi modules to track the location of the school bus, the number of students on the bus, and their safety. The system also provides an easy-to-use interface for students, parents, and school administrators to monitor the school bus. Additionally, the system can be integrated with other existing school management systems for better tracking and monitoring. Furthermore, it can be used to analyze the data generated by the tracking and monitoring system, such as bus routes, traffic patterns, and student behavior, in order to optimize the transportation system. By providing an efficient and reliable tracking and monitoring system, the proposed system can help to improve student safety and reduce the workload of school administrators.

## II. LITERATURE SURVEY

IOT based Smart School Bus Monitoring and Notification System,Sukrutha S,Keerthana M S : IOT based School Bus Tracking and Monitoring System uses GPS technologies to provide real-time location tracking and driver adherence to the timetable. This system provides parents with the ability to track their ward's location and receive notifications when their ward boards or alights the bus. School administrators can also contact drivers and parents, as well as notify them of any emergency or complaint. Additionally, RFID readers are used to track student entry and exit from the bus, ensuring the safety and security of students while they are on the bus. This system also allows for better coordination between parents, school administrators, and bus drivers, making it easier to ensure the safety of students while they are travelling on the bus. [1]

SMART SCHOOL BUS MONITORING SYSTEM USING IOT,Raja Godwin D,Abisha blessy E : The Smart school bus monitoring system proposed in this paper aims to improve the safety, efficiency, and comfort of school bus transportation through the utilization of IOT technology. By leveraging real-time data and automated notifications, it provides a comprehensive solution for monitoring and managing school bus operations.The system also incorporates a mobile application or web interface, which allows parents to track the location of the school bus and receive notifications regarding its status. This gives parents peace of mind by providing them with accurate and timely information about their child's transportation.[2]

IOT Based Smart School Bus Monitoring and Notification System, Judy Thyparampil Raj,Jairam Sankar : The IOT-based smart school bus monitoring and notification system outlined in this paper offers a comprehensive solution to improve the safety and management of school bus transportation. By leveraging real-time data and automated notifications, it aims to enhance the overall experience for students, parents, and school administrators.

The system can generate automated reports on bus performance, including factors such as speed, fuel consumption, and maintenance requirements. This information enables school authorities to optimize bus routes, identify potential issues, and enhance operational efficiency. [3]

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## III. METHODOLOGY

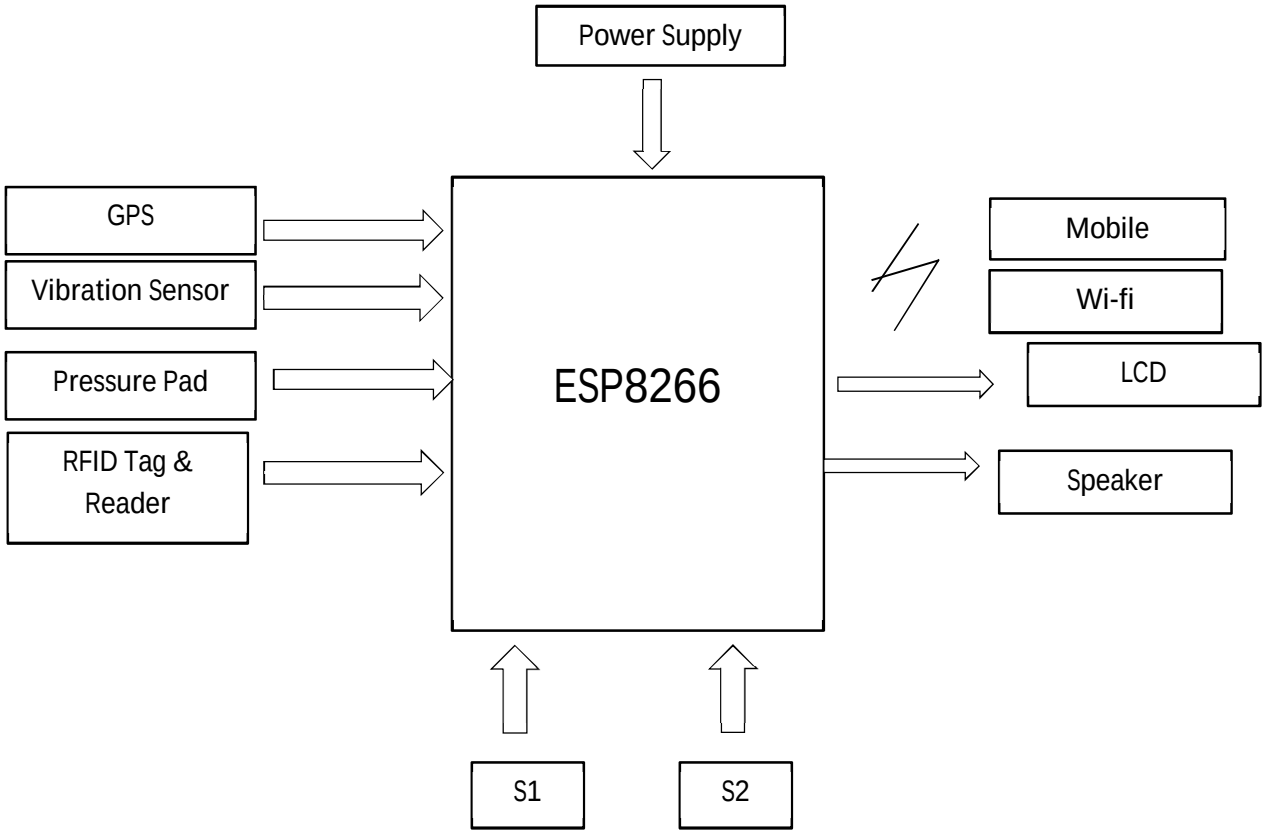



Fig 1. Block Diagram of Proposed System.

1) *Problem Identification:* The researchers identify and understand the challenges associated with school bus transportation, such as delays, overcrowding, and unauthorized access.
2) *Requirement Gathering:* They collect specific requirements for the system through interviews, surveys, and discussions with stakeholders, including parents, school authorities, and bus drivers.
3) *System Design:* Based on the gathered requirements, the researchers design the system by defining its structure and components, such as GPS trackers, RFID tags, and a central monitoring unit. They also consider functional aspects during the design phase.
4) *Implementation:* The designed system is implemented by integrating IOT devices and sensors into the school buses, developing the software for the central monitoring unit, and establishing the necessary connectivity and communication infrastructure.
5) *Data Collection and Processing:* Real-time data from various sources, such as GPS trackers and RFID tags, is collected and processed. The data is analyzed to extract valuable information, including bus locations, student attendance, and environmental conditions.
6) *Notification and Alert Mechanism:* An automated mechanism is developed to generate real-time notifications and alerts. This ensures that parents, school authorities, and bus drivers receive timely updates about critical events such as delays, route deviations, or emergencies.
7) *Testing and Validation:* The system undergoes thorough testing to ensure its functionality, reliability, and accuracy. Different scenarios are simulated to evaluate its performance under various conditions. Feedback from users and stakeholders is gathered to improve the system further.
8) *Deployment and Evaluation:* The final step involves deploying the IOT-based smart school bus monitoring system in a real-world setting. The system's performance, effectiveness, and user satisfaction are evaluated over an extended period. Based on the evaluation results, necessary adjustments and enhancements are made to optimize the system.

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## IV. RESULT AND DISCUSSION

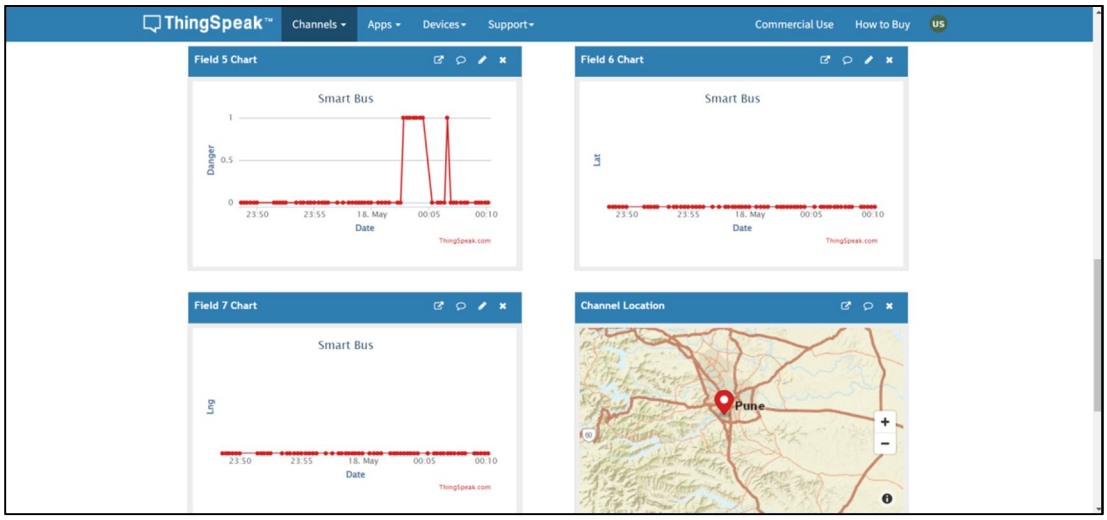



Fig 2. ThinkSpeak Output

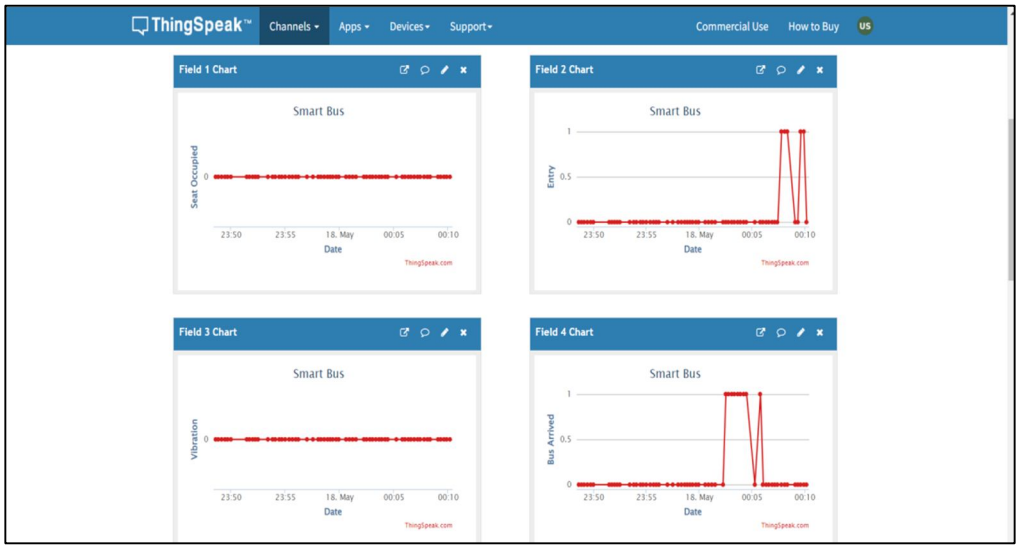



Fig 3. ThinkSpeak Output.

ThingSpeak is an Internet of Things (IOT) platform that enables the collection, analysis, and visualization of sensor data from connected devices. In the above fig 2 field 5 belongs to alert or danger , field 6 & 7 displays latitude and longitude respectively. In fig 3 field 1 shows seat occupied by the student using pressure pad , field 2 display student entry in bus , field 3 detect the vibration , field 4 shows the bus is arrived.

## V. PERFORMANCE PARAMETER

**Accuracy:** A high level of accuracy is important in a school bus tracking system because it ensures that the location information provided by the system is reliable and up-to-date. The accuracy is typically measured in terms of distance, such as meters or feet, and it is influenced by various factors such as the GPS device used, the strength of the GPS signal, and the presence of obstacles that can interfere with the GPS signal, such as buildings or trees. Accuracy is a critical performance parameter for a school bus tracking system, as it directly affects the reliability and effectiveness of the system in tracking the location of the school bus.

**Reliability:** The system should be reliable and able to operate under different weather and traffic conditions. It should also have backup power sources and redundancy features to ensure that the system is always operational.

A reliable school bus tracking system also needs to be able to operate under different weather and traffic conditions, such as heavy rain, snow, or traffic congestion. It should be able to handle high volumes of data traffic and provide real-time updates to the school administrators and parents.

1) *Responsiveness:* The system should be responsive and able to send alerts and notifications in real-time. This is especially important in emergency situations, where timely alerts can save lives. A responsive school bus tracking system should also be able to send alerts and notifications in emergency situations, such as accidents or breakdowns. In such cases, the system should automatically send alerts to the relevant authorities and emergency services, such as the police or ambulance services.
2) *Cost-effectiveness:* The system should be cost-effective, with a balance between performance and cost. The system should not be too expensive, but at the same time, it should provide the necessary features and performance requirements to ensure the safety and security of the school bus system.

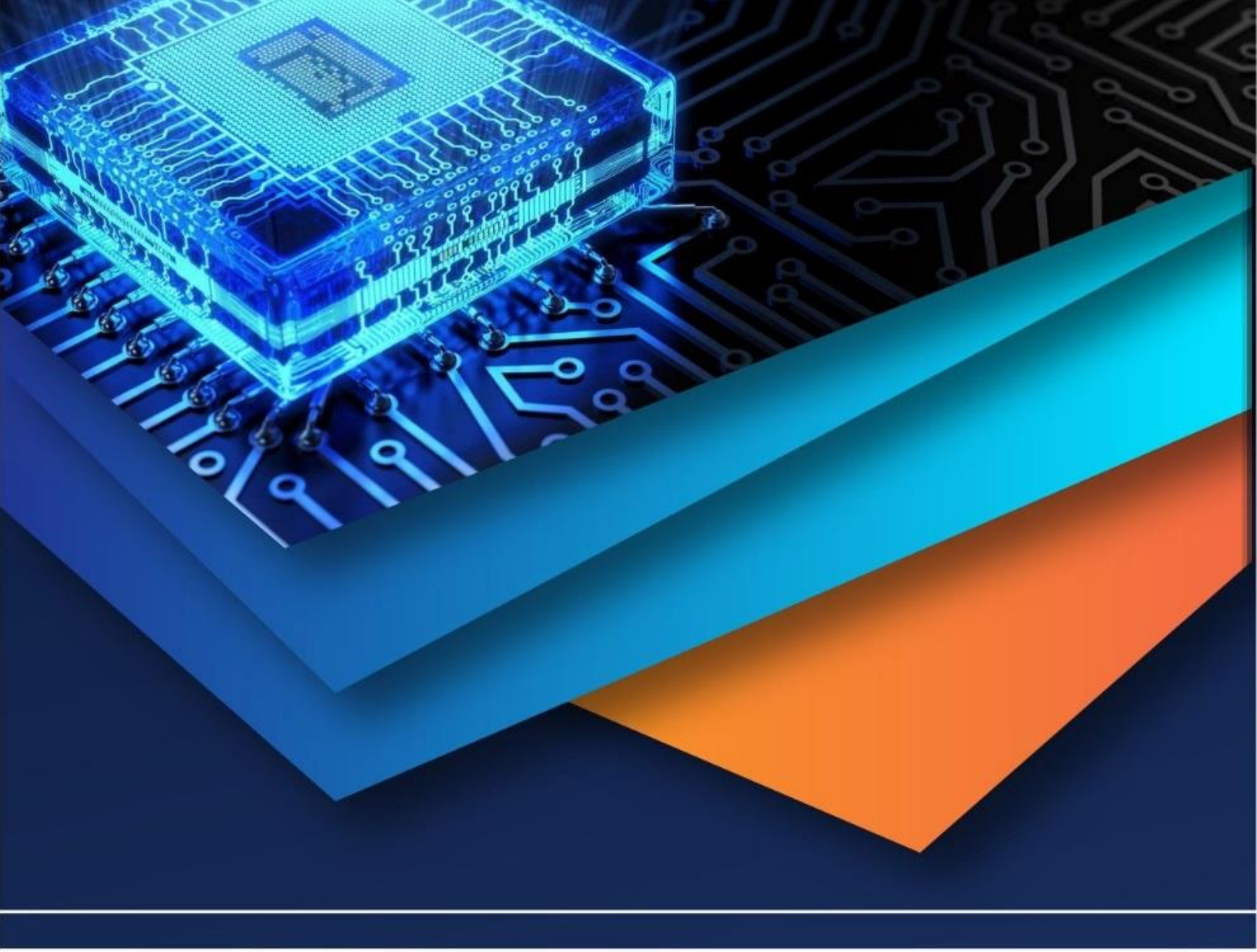
## VI. CONCLUSION

This project developed an IOT based school bus tracking and monitoring system to provide comprehensive safety for students and school staff members. The system utilizes GPS tracking, student identification, and other features to monitor the location and performance of school buses in real-time. Additionally, the system can provide alerts to school staff in the event of any delays, detours, accidents, or other issues. This system can be used to improve the efficiency of school bus routes and ensure the safety of students.

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