Project Title: Public Transport Optimization

Project Description:
The project involves integrating IoT sensors into public transportation vehicles to monitor ridership, track locations, and predict arrival times. The goal is to provide real-time transit information to the public through a public platform, enhancing the efficiency and quality of public transportation services. This project includes defining objectives, designing the IoT sensor system, developing the real-time transit information platform, and integrating them using IoT technology and Python.

➢ **Data Collection:** Collect GPS coordinates and timestamps continuously, scan RFID cards during boarding and disembarking, and capture time stamped photos periodically.

➢ **Data Processing:** The microcontroller processes GPS, RFID, and camera data, checking for route compliance, verifying student disembarkation, and storing data securely.

➢ **Alerts and Communication:** Trigger SMS alerts for deviations or unauthorised stops, RFID registration issues, and unusual bus events, also integrating Telegram for real-time monitoring.

➢ **Data Storage:** Store collected data securely in local or cloud storage.

➢ **User Interface:** Create a web-based dashboard and mobile app for real-time bus tracking by parents and fleet management by school administrators.

➢ **Power Supply and Security:** Ensure a reliable power source and implement encryption for data security.

➢ **Compliance and Maintenance:** Comply with regulations on student data and establish a maintenance schedule for system reliability.

Components and Sensors:

➢ **GPS Module:** Use a GPS module to track the school bus's real-time location.

➢ **GSM Module:** Incorporate a GSM module to transmit data and send SMS alerts.

➢ **RFID Reader:** Install an RFID reader on the school bus to identify students as they board and disembark.

➢ **Camera:** Attach a camera inside the bus to capture photos and videos.

➢ **Microcontroller:** Utilize a microcontroller (e.g., Arduino, Raspberry Pi) to collect and process data from these sensors.

Design Challenges:

➢ **Real-Time Data Processing and Integration:** Efficiently process real-time data from multiple sensors and synchronize diverse data sources accurately.

➢ **Geofencing, Route Compliance, and Communication:** Design a precise geofencing system for route monitoring without false alerts and ensure reliable communication.

➢ **Data Security, Privacy, and Cost Management:** Securely store sensitive student data, implement robust security measures, and balance component quality with budget constraints.

➢ **Power Management, Scalability, and System Management:** Manage power efficiently, design for scalability, and implement robust system management strategies for long-term reliability.

➢ **User Interface, Regulatory Compliance, and Maintenance:** Create a user-friendly interface, address regulatory compliance, and establish a maintenance schedule with effective training for system management.

Github link

https://github.com/Prishamanoharan/school-bus-monitoring.git