INTERNET OF THINGS BASED KSRTC LOCAL BUS ARRIVAL AND DEPARTURE MONITORING SYSTEM

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Internet of Things, Bus Tracking System, RFID, Ultrasonic Sensor, ESP32, Real-Time Monitoring.

Introduction:

1. The Internet of Things based KSRTC Local Bus Arrival and Departure Monitoring System aims to automate the monitoring process at bus depots by integrating RFID technology, sensors, embedded systems, and wireless communication.
2. The system enables real-time detection of bus arrival and departure events and updates this information to a centralized digital platform.
3. This project contributes to strengthening digital transport infrastructure and aligns with smart city development goals by improving operational efficiency, accuracy, and transparency.

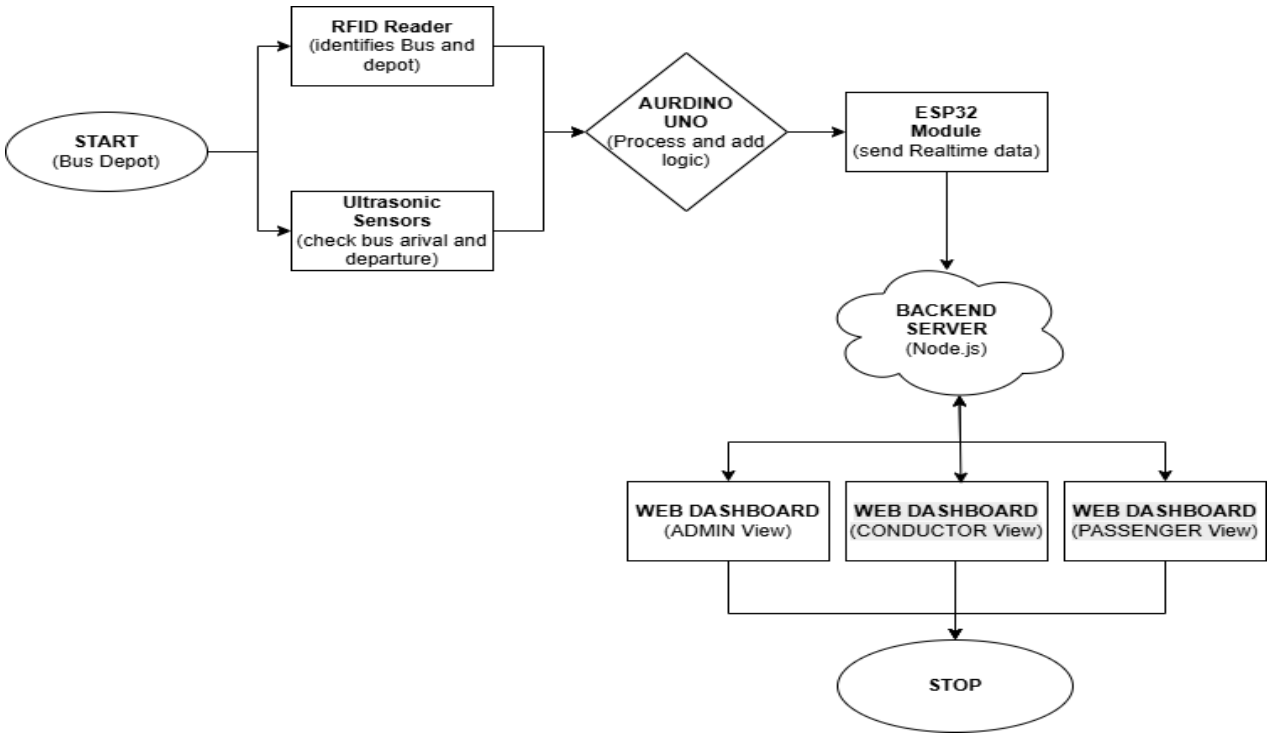

Figure 1: Flowchart of the System

Objectives:

1. Real-Time Bus Tracking and Status Monitoring.
2. Centralized Backend Management.
3. Multi-User Web Interface (Admin, Conductor, and Passengers).
4. Automated Arrival and Departure Detection.
5. RFID-Based Bus Identification.

Methodology:

The system starts and initializes all required hardware components including the RFID module, ultrasonic sensors, and the ESP32 communication module. The system continuously scans for an RFID tag to detect the arrival of a bus. When an RFID tag is detected, the system reads the bus number and sets the bus status to "active". The system immediately reads the ultrasonic sensors to confirm the physical presence of the bus. If the ultrasonic sensors detect the bus, the system updates the bus status to "Arrived" and prepares a JSON request containing the bus ID, status, and timestamp. The ESP32 sends this arrival information to the backend server using an HTTP PUT request at the endpoint /buses /id /location. After sending the arrival data, the system continues monitoring the ultrasonic sensors to check whether the bus is still present. When the sensors confirm that the bus has left the detection area, the system updates the bus status to "Departed" and prepares another JSON request. The ESP32| sends the departure information to the server using another PUT request at /buses/id/location. The server updates the dashboard to reflect real-time bus arrival and departure status for users. After updating the dashboard, the system restarts the loop and begins scanning again for the next RFID detection.

Result and Conclusion:

1. The IoT-based KSRTC Bus Arrival and Departure Monitoring System was successfully implemented using RFID, ultrasonic sensors, Arduino Uno, and ESP32.
2. It demonstrates reliable real-time detection, stable wireless communication, and effective automation that improves transparency and reduces passenger uncertainty at bus depots.

References:

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Future Scope:

The future scope of this project includes

1. In the future, the system can be enhanced by integrating GPS modules to enable both depot-level and route-level bus tracking for end-to-end monitoring.
2. Mobile applications can be developed for passengers and conductors to provide instant notifications, alerts, and real-time updates.
3. Cloud-based databases and analytics can be incorporated to store historical data and generate insights for route optimization and scheduling.
4. The system can also be extended to support multiple depots with centralized control for transport authorities.
5. Additionally, incorporating AI-based prediction models can improve arrival time estimation and operational planning.