Phase 1: Problem Definition and Design Thinking Document

Enhancing Public Transportation with IoT Sensors

Objective:

Incorporating IoT technology is the focal point of this project, with the primary goal being to enhance public transportation quality. Real-time information about parking availability and transit schedules can be accessed in a novel way by integrating smart sensors into vehicles, revolutionizing how commuters access said information.

Design Thinking

1. Project Objectives:

- **Real-time parking space monitoring:** This facet focuses on providing users with immediate feedback on parking availability. This not only reduces time spent searching for parking but also minimizes congestion in high-traffic areas.
- **Mobile app integration:** The creation of a user-friendly mobile application serves as a vital component of this project. It acts as a portal for individuals to access real-time data, including parking availability and transit schedules, effortlessly.
- **Efficient parking guidance:** This objective seeks to streamline the parking process for both commuters and operators. Clear, real-time guidance will ensure that parking spaces are utilized optimally, leading to enhanced traffic flow and a more efficient transportation system overall.

Approach:

In pursuit of these objectives, our strategy centers around creating a seamless and intuitive experience for users. By addressing the pain points associated with public transportation, we aim to significantly improve the overall commute experience.

2. IoT Sensor Design:

Purpose:
The core purpose of the IoT sensors is to accurately determine the occupancy status of parking spaces. These sensors play a critical role in providing real-time information to users.

Components:

- **Ultrasonic sensors for occupancy detection:** Chosen for their exceptional accuracy and low energy consumption, these sensors are well-suited for continuous monitoring of parking spaces.

- **Raspberry Pi for data collection and processing:** Serving as the central processing unit, the Raspberry Pi will facilitate seamless communication between the sensors and the mobile app.

Deployment Plan:

Strategic placement of sensors within each vehicle ensures comprehensive coverage of all parking spaces. Data collected by these sensors will be transmitted to a central Raspberry Pi unit for further processing.

Approach:

The selection of ultrasonic sensors is rooted in their proven reliability and efficiency in detecting occupancy. This ensures that the information relayed to users is consistently accurate, enhancing the overall effectiveness of the system.

3. Real-Time Transit Information Platform:

Purpose:
The mobile app serves as the interface through which users access real-time information on parking availability.

Features:

- **Map view showing available parking spaces:** Providing a visual representation of parking availability allows users to quickly identify suitable parking options.
- **Notifications for users about parking availability:** Timely notifications further streamline the process, ensuring users receive relevant information precisely when they need it.
- **Integration with GPS for real-time location tracking:** Leveraging GPS technology enables accurate tracking of vehicle locations, contributing to the provision of reliable real-time information.

Approach:

The design of the app prioritizes simplicity and ease of use. Intuitive navigation and clear visual cues empower users to swiftly access the information they need, enhancing their overall experience.

4. Integration Approach:

Data Flow:

1. Ultrasonic sensors continuously gather occupancy data.
2. This data is transmitted to the central Raspberry Pi unit.
3. The Raspberry Pi processes the data and transmits it to the mobile app for user access.

Hardware Requirements:

- Raspberry Pi for data processing.

Approach:

The Raspberry Pi acts as the central hub, efficiently processing data and ensuring that users receive timely and accurate information via the mobile app.