

smart parking

Project Objectives:

The project aims to develop a real-time parking availability system that can help drivers find available parking spaces quickly. The key objectives are to:

Reduce the time and stress associated with finding parking.

Improve traffic flow by guiding drivers to open parking spaces.

Enhance user experience through a user-friendly mobile app.

Utilize IoT sensors to collect and transmit real-time parking data.

Integrate a Raspberry Pi as a central data hub and decision-making component.

Implement a robust and efficient software system to process and display parking availability information.

IoT Sensor Setup:

For this system, we'll use ultrasonic sensors placed in parking spaces to detect the presence of a vehicle. Each sensor will be connected to a microcontroller (e.g., Arduino or ESP8266) that sends data to a central Raspberry Pi. Here's a simplified



schematic of the sensor setup:

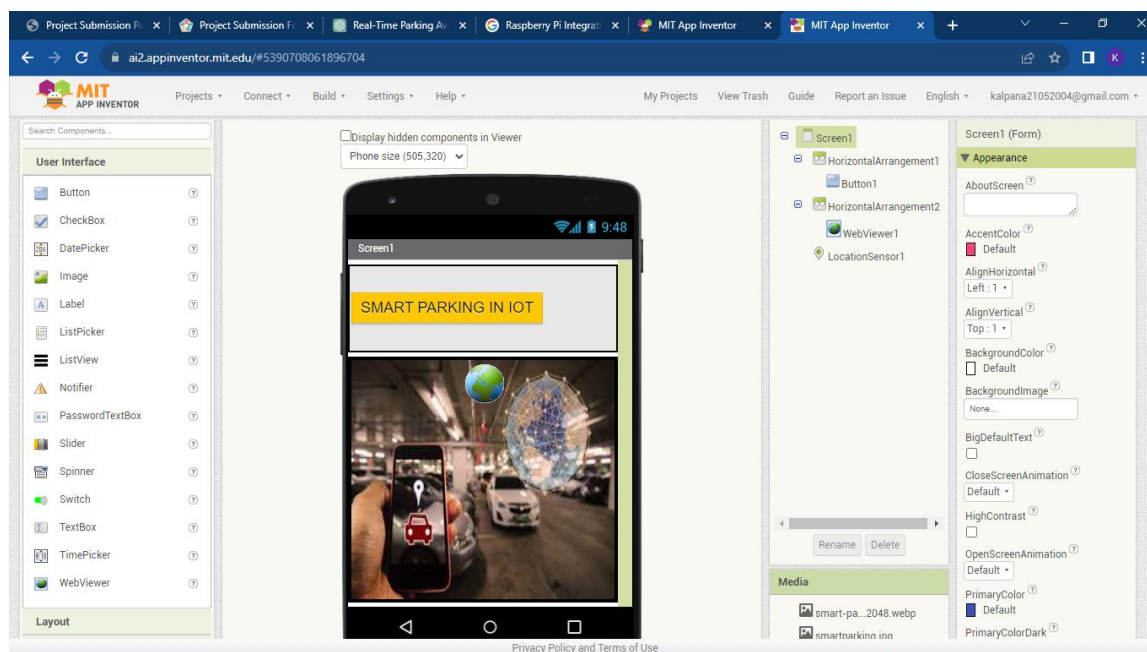
Mobile App Development:

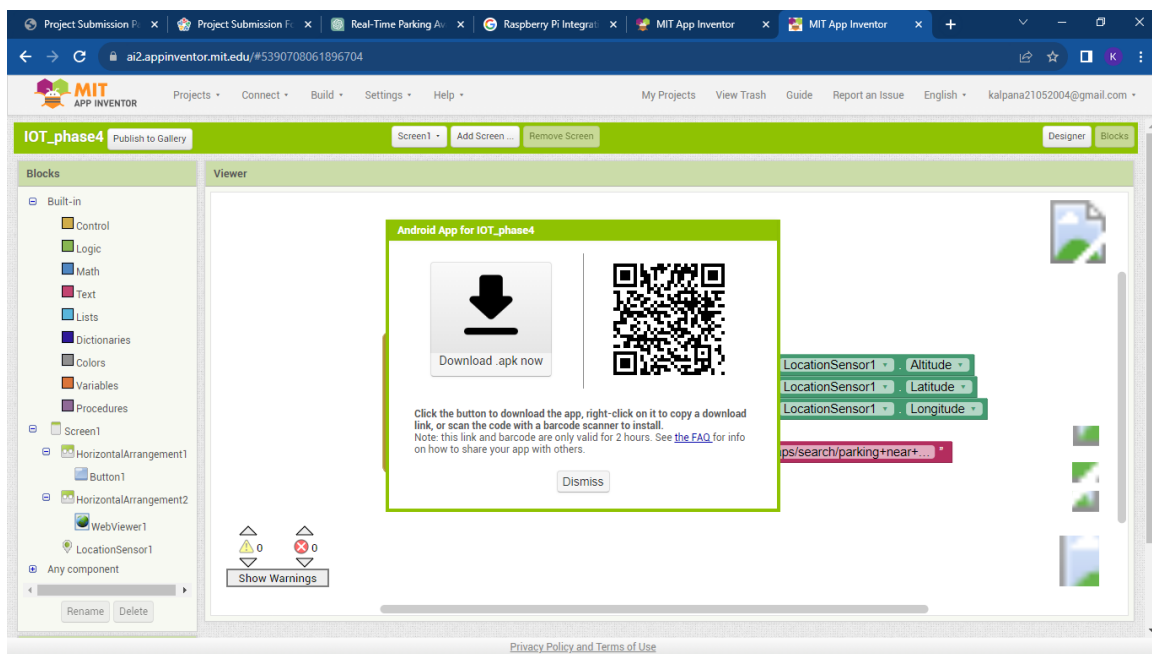
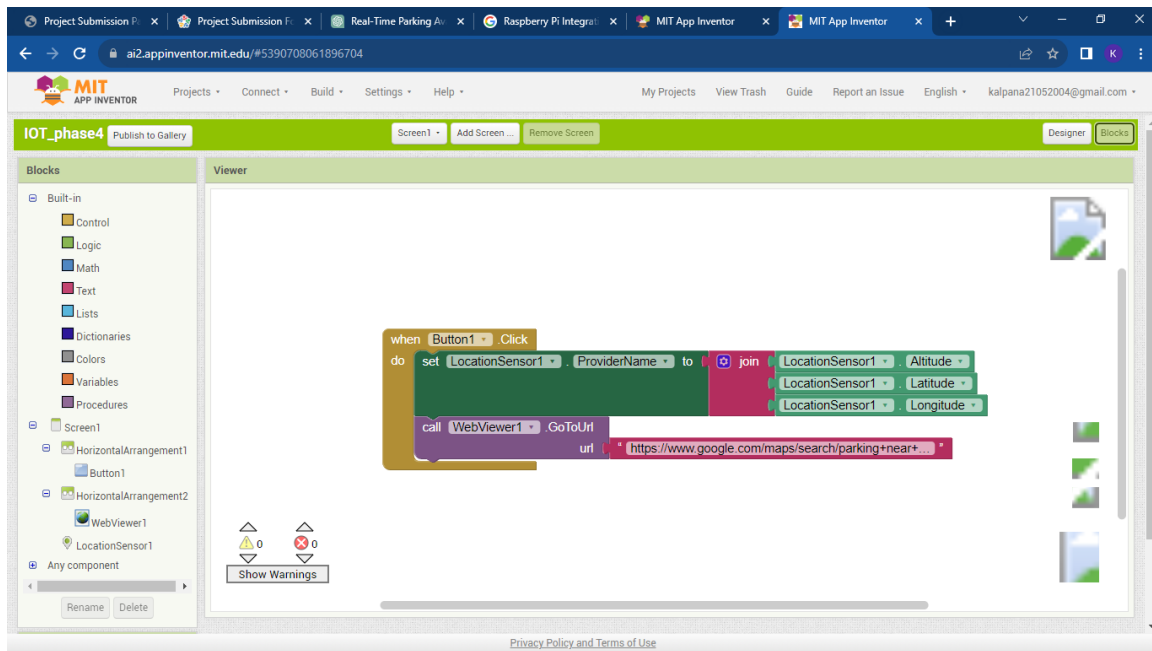
The mobile app is a critical component that provides real-time parking information to users. Users can view available parking spaces and get directions to the nearest open spot. The app should have a user-friendly interface with features like user registration, GPS integration, and real-time updates. Here's a mock-up of the app's main screen:

Mobile App Main Screen

The Raspberry Pi serves as the central hub for data collection, processing, and distribution. It receives data from the IoT sensors, processes it, and makes it available to the mobile app. Additionally, the Raspberry Pi can control LED displays in the parking lot to indicate available spaces. Here's a simplified block diagram of the Raspberry Pi integration:

Raspberry Pi Integration







Code Implementation:

The code implementation involves the following aspects:

Code for the IoT sensors to measure distances and send data to the Raspberry Pi.

Code for the Raspberry Pi to receive and process sensor data.

A backend server to handle communication between the mobile app and the Raspberry Pi.

Code for the mobile app to display parking availability and provide navigation features.

Here is a high-level code flow:

Sensors collect data and send it to the Raspberry Pi.

The Raspberry Pi processes the data, determines parking availability, and updates the database.

The mobile app communicates with the backend server, which queries the database for real-time parking information.

The app displays parking availability and provides directions to open spots.
import
time

Simulated parking space availability

```
parking_spaces = {
```

```
    "A1": True,
```

```
    "A2": True,
```

```
    "A3": True,
```

```
    "B1": True,
```

```
    "B2": True,
```

```
    "B3": True,
```

```
}
```

```
def check_parking_space_availability():
```

```
    while True:
```

```
        print("\nCurrent Parking Space Availability:")
```

```
for space, is_available in parking_spaces.items():  
    status = "Available" if is_available else "Occupied"  
    print(f"Space {space}: {status}")  
  
time.sleep(5)  # Simulating real-time updates every 5 seconds
```

```
def simulate_car_arrival(space):  
    if space in parking_spaces and parking_spaces[space]:  
        parking_spaces[space] = False  
        print(f"Car has arrived and parked in Space {space}.")  
    else:  
        print(f"Space {space} is already occupied.")
```

```
def simulate_car_departure(space):  
    if space in parking_spaces and not parking_spaces[space]:  
        parking_spaces[space] = True  
        print(f"Car has departed from Space {space}.")  
    else:  
        print(f"Space {space} is already available.")
```

```
if __name__ == "__main__":  
    check_parking_space_availability()
```

Benefits of the Real-Time Parking Availability System:

Time and Stress Reduction: Drivers can quickly find available parking spaces, reducing the time and frustration associated with parking search.

Traffic Flow Improvement: By guiding drivers to open parking spaces, the system can help reduce congestion in parking lots and on nearby roads.

Environmental Impact: Reduced circling for parking means less fuel consumption and lower emissions, contributing to a greener environment.

User Convenience: The mobile app offers an easy-to-use platform for drivers to access real-time parking information and directions.

Data Collection: The system collects valuable data on parking usage, which can be used for future city planning and parking management.

Revenue Generation: Parking operators can use the system to manage and optimize their facilities, potentially increasing revenue.

Overall, a real-time parking availability system offers significant advantages to both drivers and parking operators by making parking more convenient, efficient, and environmentally friendly.

