Drone Simulation

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New Features

Drone Battery:

- Each drone has a battery
- Charge at charging stations

Subscription:

- Drone is a publisher
- Simulation (front-end) is the subscriber

Name: Drone

Battery Level: 90.93%

Mode: idle

Availability: Available

Why choose these features

Simulation seems unrealistic
- Real drones need to stay plugged in or need a battery
- Simulate the range and efficiency of different drone types

We want to see information, and so do customers
- Where is the drone?
- What is it doing?
- Need real-time updates

Part 1

Charging Station (Factory Method)

- CS need to be created on the map as entities
- Drone needs places to charge on the map
- Drone's battery charges when it's near a charging station

Drone Battery (Decorator)

- Wrap the Drone with battery
- Drone has a battery instance, calls instance to charge battery and to get battery info

Drone Logic

- If Drone's battery is less than 15%, go charge
  - Finds nearest CS, moves to it
- If Drone is available, check if there is a package
- Check if Drone has enough battery range to make the trip
  - Trip distances calculated using the position of four points:
    1. Drone
    2. Package
    3. Customer
    4. Closest Charging Station
- If the drone cannot make the trip it goes to closest charging station
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Part 2

IPublisher (Observer Method)

- The IPublisher Interface serves as the foundation
- Acts as central manager for notifications
- Allows other objects to sign up for updates with "subscribe" method
- Scalable & Flexible

ISubscriber (Observer Method)

- Represents Subscriber component
- Reacts to notifications from IPublisher
- Critical in Front-end responsiveness
- Scalable & Flexible

Notification Logic

- Whenever an event occurs, IPublisher prepares a notification
- Notification details are encapsulated in JSON for information transfer
- Upon receiving notification, ISubscribe responds
  - Each subscriber processes information
  - Updates the UI with new information
- This process ensures real-time updates across the system. Reflects latest changes & statuses
- This feature is very practical & useful not only for the owners but for the consumers as well

Simulation Demonstration

Shortcomings

- More research needed for battery discharge rate
  - Moving, moving with package, staying idle…
  - Current rate doesn't allow Drone to go from one corner to another for a delivery
- Tested only with A* path finding algorithm
  - Drone will lose more battery with DFS, BFS

Write up - https://docs.google.com/document/d/1ErNnD-qI4nqKEIUrx5kDGVWK9K3mnw4s/edit
Documentation - https://docs.google.com/document/d/1At5OwZ-LFjNTh22B_lxnkLcxsokHAaZ9qbSkN3j95eA/edit