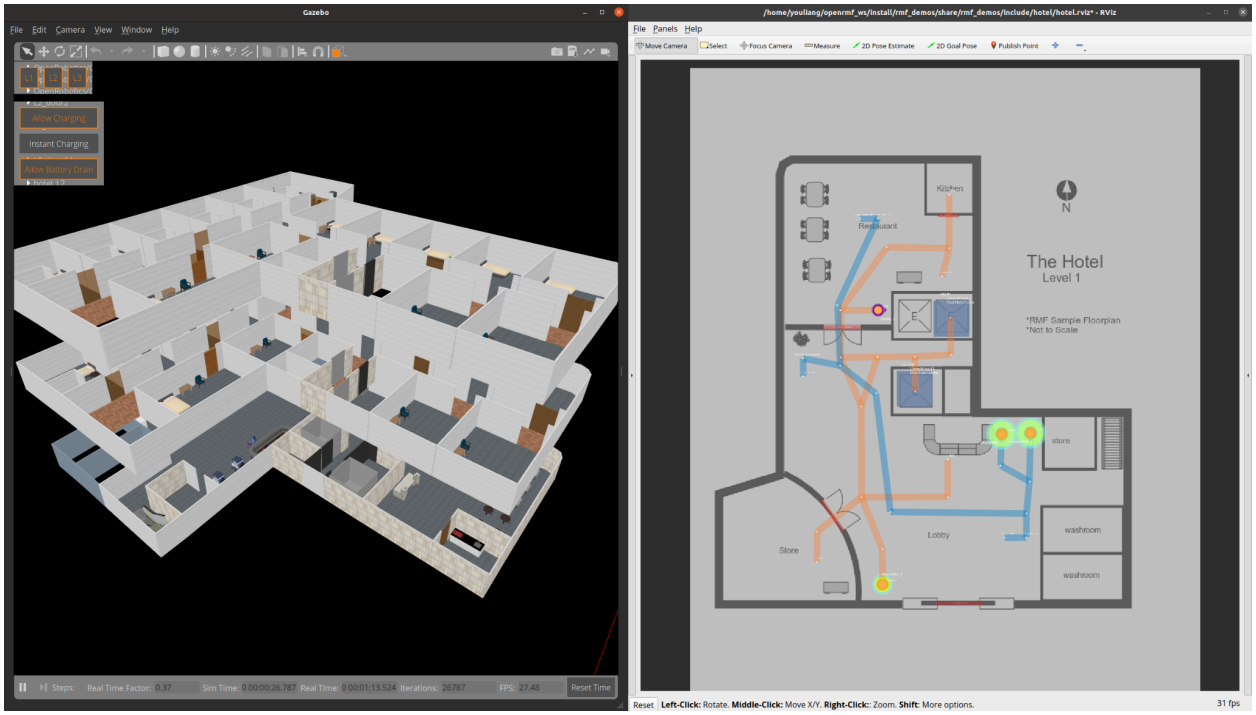
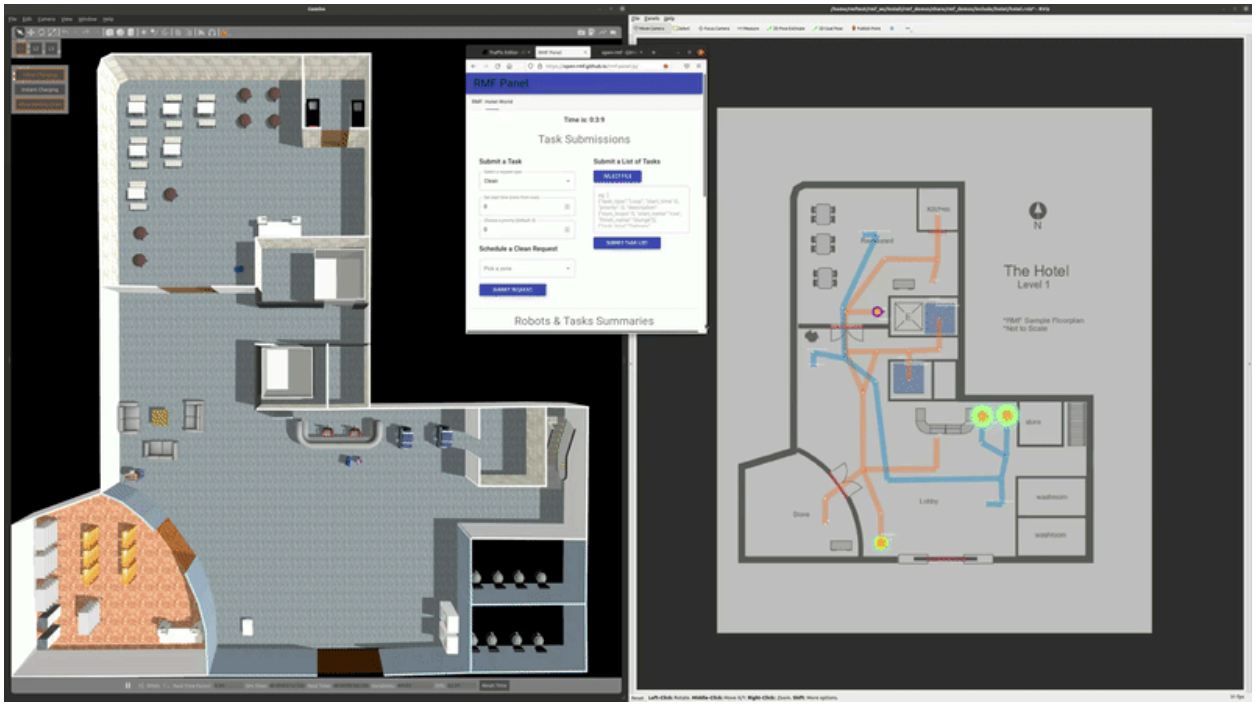
Robotics Assignment Submission

1. What do you think the best approach would be in path planning of a differential drive robot in a multi-robot environment? You can start with assuming two robots where each robot has the knowledge of another robot in the surrounding environment. Explain the approaches which you think might work and why any particular approach would be better than other approaches that you came across. The path replanning should be real-time in a way that the robot should not collide with the other robots in the surrounding area.

Answer:

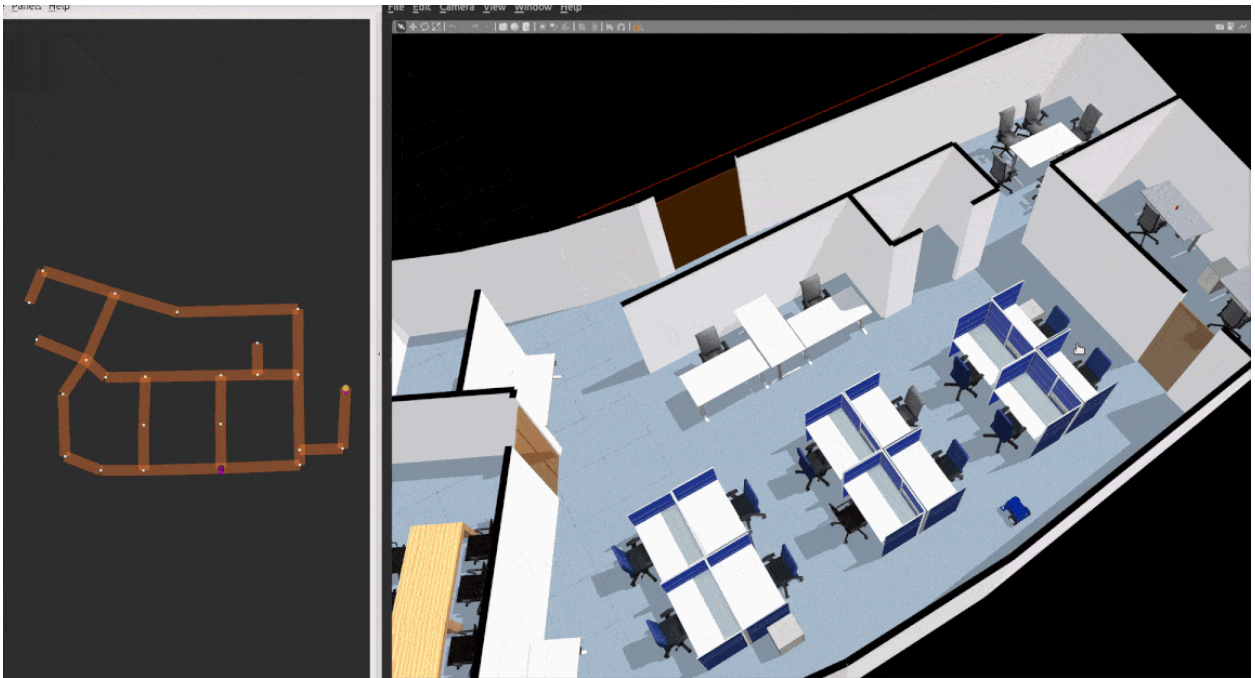
The first thing that comes to my mind when I think about multi-robot environment is **Open-RMF.** The **Open Robotics Middleware Framework** (Open-RMF) is a free, open source, modular software system that enables sharing and interoperability between **multiple fleets** of robots and physical infrastructure, like doors, elevators and building management systems.



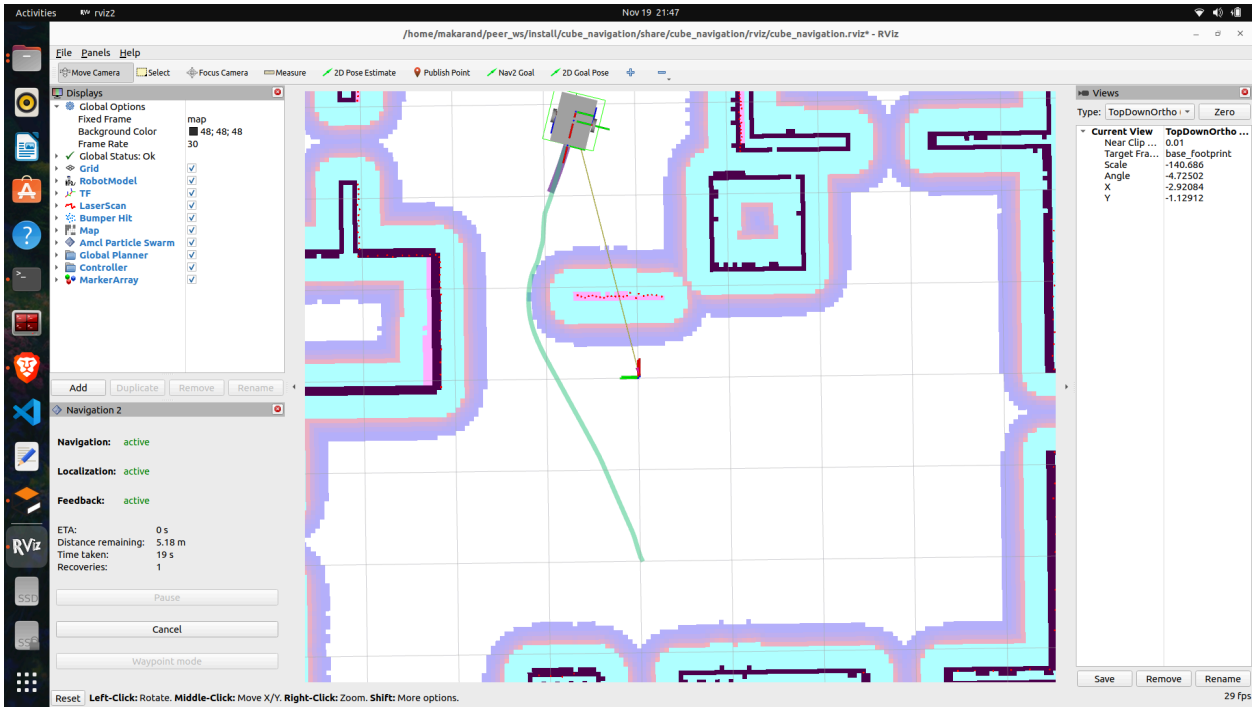


While decentralized and hybrid systems can work, Open-RMF's centralized coordination ensures **system-wide optimization**, which is crucial for avoiding deadlocks and ensuring fairness in resource usage. Moreover, the framework's ability to **dynamically adapt to changing environments** makes it highly suitable for real-world applications where unpredictability is common.

For handling **dynamic obstacles** (e.g., a human entering the robot's path or a robot malfunctioning):
Open-RMF does not directly handle low-level motion planning but communicates with the robot's onboard planner, which can locally adjust for dynamic obstacles. Robots equipped with **local planners** (e.g., **DWA**, TEB, or model predictive control) can react in real time to avoid immediate collisions.



Another approach to this problem is directly using **DWA(Dynamic Window Approach)**:
This method is simple yet efficient as it directly using navigation stack to dynamically avoid obstacle that comes in its path.



More about this in repository. Please refer README.md
/robot_multiple/README.md