

ECSE/CSDS 376/476  
**Lab 3: Navigation enhancements**  
Assigned: 4/2/21  
Due: 4/9/21

This assignment is a **group** assignment. It builds on your mid-term project results.

You should make the robot navigate to two docking stations, with coordinates as follows:

Table 1:

- Translation: [3.903, 0.412, 0.000]
- Rotation: in Quaternion [0.000, 0.000, -0.006, 1.000]  
in RPY (radian) [0.000, -0.000, -0.012]  
in RPY (degree) [0.000, -0.000, -0.689]

Table 2:

- Translation: [0.542, 2.572, 0.000]
- Rotation: in Quaternion [0.000, 0.000, 0.696, 0.718]  
in RPY (radian) [0.000, -0.000, 1.539]  
in RPY (degree) [0.000, -0.000, 88.176]

This will require a means to **back up** to move away from each location. Your code should make the robot move to table 1, then move from table 1 to table 2, then move from table 2 back to “home.” Looking forward, you should define an architecture in which commands to move to table 1, from table 1 to table 2, and from table 2 to home are initiated as part of a larger plan (specifically, after tasks of perceptual processing and manipulation are complete).

In addition, you should insert some initial safe movement to help lock in AMCL. (You can watch the array of candidate poses compress as the robot becomes more certain of its pose in the map).

There is also a problem with initializing the steering algorithm. If the robot is not started from “0,0,0”, it will lurch when steering is started. You should modify the code to enforce that the initial goal pose is equal to the current pose.

It may also help to modify `pub_des_state` such that each new computed path segment will start from the robot’s actual pose (per AMCL).

### **Deliverables:**

Submit a (group) report. Include data documenting the robot’s performance (e.g., `tf_echo` and, ideally, a video).

Describe what changes you had to make to the code to get this to work. Include a link to your code on github.

Describe observations—what worked, what didn’t, what surprised you.

Include observations. What surprised you? What worked? What did not? Include comments on the remote lab experience.

Please note that there is an additional (required) “assignment” to enter self and partner rankings (for progress up to/including the mid-term project).