LAB 7: AUTONOMOUS WAREHOUSE

Due: Dec. 14th, 11:30am

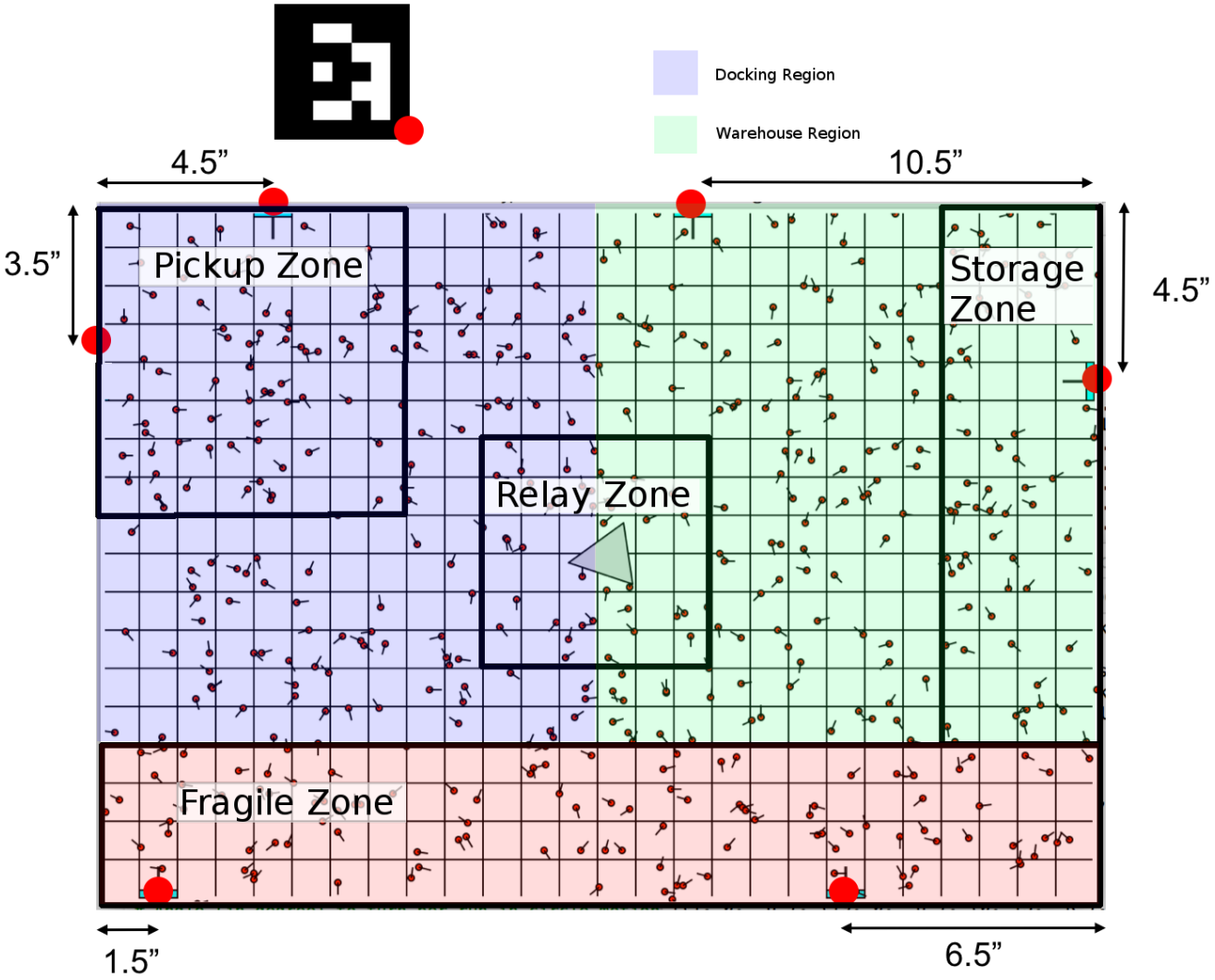
In this lab, your Cozmos will collaborate to manage a warehouse autonomously. This is one of the more intricate labs, so please make sure to read through this entire lab sheet fully.

Task: Your goal is to deliver any boxes that show up in the "Pickup Zone" to the "Storage Zone" by way of the "Relay Zone". However, to speed up the process, two Cozmos are going to share the work! One robot will be assigned to work in the "Docking Region" and the other will be assigned to work in the "Warehouse Region". Each robot should not stray too far outside its designated region for too long. Each robot will work relatively independently of each other, so coordination is not necessary.

Robots will begin in the center of one of the regions, with random orientation, but will not be told ahead of time which region they are in. This requires them to identify what role they have been assigned to via localization. The docking region robot will have the task of waiting for boxes to appear in the pickup zone and delivering them to the middle of the relay zone. The warehouse region robot will be waiting for boxes to be delivered to the relay zone and, once the box is stationary, should deliver them to the storage zone. All boxes should have AR tags visible.

There will be at most 1 box in the pickup and relay zones. However, there can be more than 1 in the storage zone. Positioning of these cubes is not important as long as they are contained within the storage zone boundaries so it is up to you on how you choose to arrange them.

Fragile Zone: Don't touch boxes in the fragile zone! Your robots aren't good at moving those boxes carefully. Specifically, two boxes will be placed inside of this zone such that they do not block the AR markers. You do not have to do anything with them except avoid them; points will be lost if your robot touches them.



Testing: To test, you only need to bring one working robot ready to do either task. During the lab demo your group will pair up with another team of your choosing and you will each take turns performing the two roles. You will not be penalized as a result of the other teams' actions and if their robot is unable to perform its task, the TA's will simulate it so that your robot may demonstrate its ability.

Marker detection: See Lab 6

Localization: You may use any localization technique for this lab, although particle filters are highly encouraged.

Grading: You will demo your code for grading during class on the day the assignment is due. The assignment will be evaluated for 1) Performing the role of the "Docking Region" robot and successfully delivering at least two boxes 2) Performing the role of the "Warehouse Region" robot and delivering at least two boxes. For each of these roles, delivering a third box successfully will result in 2.5 points of extra credit. (For a final maximum grade of 105)

Due to the probabilistic nature of the particle filter, not every run will lead to success. To test the robustness of your code we will conduct three runs and take sum of the best two.

Our grading rubric will look like this:

Group #	Run	Docking robot boxes #'s 1 & 2	Warehouse robot boxes #'s 1 & 2	Box #3	Fragile box Penalty	Run Subtotal	Total (sum best 2 of 3)
	1	/25	/25	/5	/-5	/50	/100
	2	/25	/25	/5	/-5	/50	
	3	/25	/25	/5	/-5	/50	

Submission: Submit only your `warehouse_robot.py` file, make sure you enter the names of both partners in a comment at the top of the file. Only one partner should upload the file to T-Square. If you relied significantly on any external resources to complete the lab, please reference these in the submission comments.