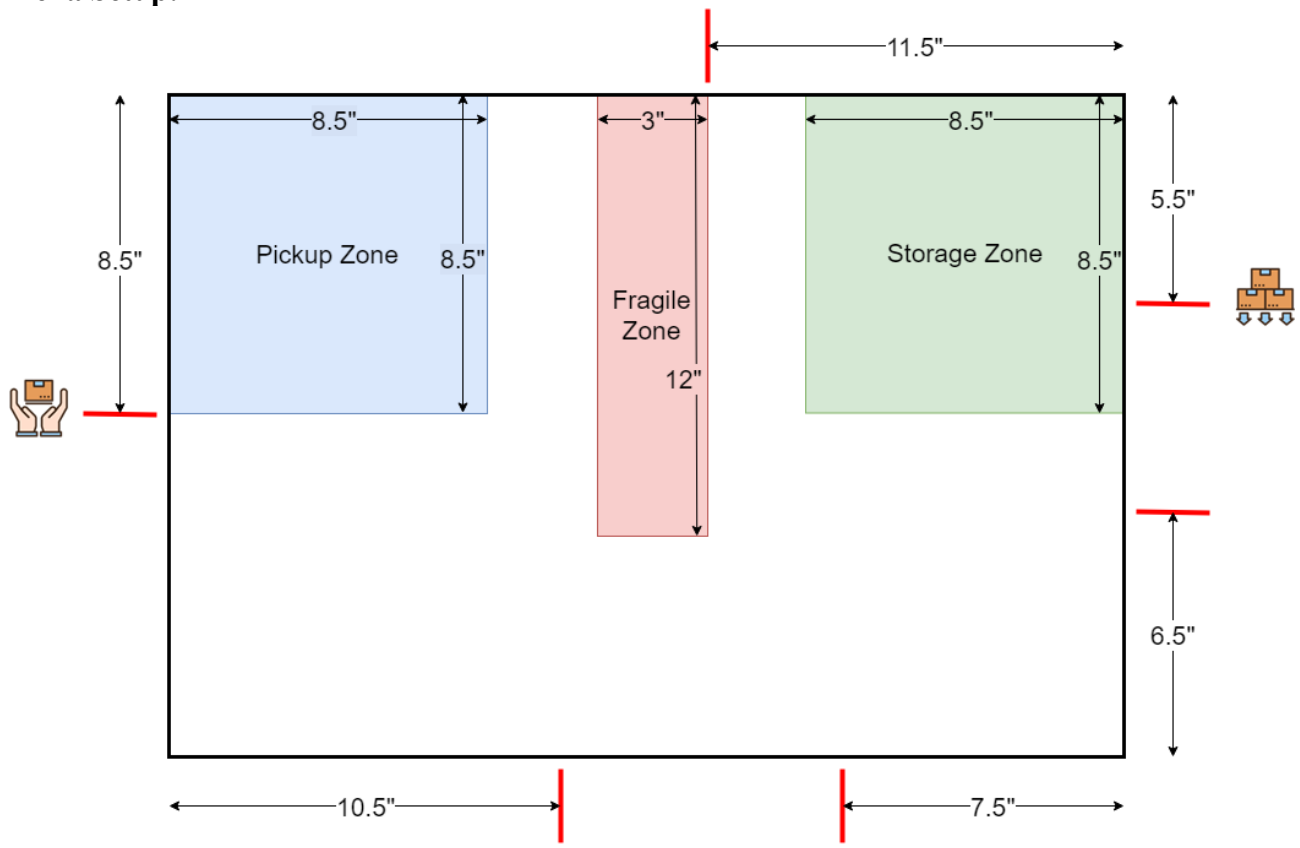
LAB 6: WAREHOUSE AUTOMATION

Due: April 22nd, 5:00pm

In this lab, your robot will be tasked with automating a warehouse. It will have to collect packages (cubes) from the pickup zone and deliver them to the storage zone, avoiding the fragile obstacles in the way. Your goal is to deliver as many packages as possible within 5 minutes.

Arena Setup:



Starting Conditions: The robot will begin near the center of the arena with a random orientation. It will first have to localize itself, then proceed to the pickup zone. Once in the pickup zone, the robot must indicate through an audio cue that it is ready to begin delivery. From that point on, cubes will be placed one at a time within the pickup area for the robot to deliver.

Delivery: Once the delivery process has started (i.e. robot makes request while in pickup zone), a cube will be placed in the pickup zone. The robot must pick it up and deliver it to the storage zone, avoiding the fragile zone along the way. A new cube will be placed in the pickup zone once the robot leaves the pickup zone with the previous cube. If the robot delivers all 3 cubes that come with the robot, cubes will be removed from the storage area (by hand) one at a time and placed

back in the pickup zone for future deliveries. There will be at most two cubes in the storage area at any time (see example run at the end of the document).

Red lines show the center placement of localization symbols. This is the same layout as we used in Lab 4. The identify of most of the localization markers remains random and unknown, except the two symbols shown in the figure corresponding to the pickup and storage zones. You can choose to use this additional information, or to continue to use the particle filter you had which will treat all localization symbols equally.

The cubes will be placed in the **Pickup Zone** once the robot is ready to receive them. Only one cube will be placed at a time.

The robot may enter the **Fragile Zone** while it is localizing before beginning the delivery process. Once cubes are being delivered, the robot must avoid the fragile zone completely. You can think of this as a safe zone for human workers to walk in.

The **Storage Zone** is the destination for the cubes. The cubes can be placed anywhere in the storage zone as long as at least 50% of the cube is inside the storage zone. You can stack the cubes if you want.

Notes:

- There will be no starter code for this lab. You can reuse code from the previous labs.
- You may generate your own map for path planning using the measurements provided.
- At least 50% of the cube should be inside the storage zone boundary for it to be considered as delivered correctly
- The robot will be considered to be inside the fragile zone if at least 50% of the robot is within the boundary of the zone
- There will be a 5-minute limit for each run
- You may use any built-in Cozmo functions

Grading: Grades will be assigned as follows (four cubes must be delivered for full credit):

Initiating delivery process	20 pts
Cube 1	20 pts
Cube 2	20 pts
Cube 3	20 pts
Cube 4	20 pts
Cubes 5+	8 pts
Entering Fragile Zone (each time)	-5 pts

Submission: Zip and submit all your code and maps used. Be sure to enter your names in all files. One team member should submit the code to Canvas. If you relied significantly on any external resources to complete the lab, please reference these in the submission comments.

Example Run:

	# cubes in pickup	# cubes held by robot	# cubes in storage	# total cubes in arena
Robot starts in middle	0	0	0	0
Robot moves to pickup area and signals delivery start	0	0	0	0
New cube placed in pickup area	1	0	0	1
Robot picks up cube	0	1	0	1
Robot exits pickup area and starts to move away	0	1	0	1
New cube placed in pickup area	1	1	0	2
Robot places cube into storage	1	0	1	2
Robot returns to pickup	1	0	1	2
Robot picks up cube	0	1	1	2
Robot exits pickup area and starts to move away	0	1	1	2
New cube placed in pickup area	1	1	1	3
Robot places cube into storage	1	0	2	3
Robot returns to pickup	1	0	2	3
Robot picks up cube	0	1	2	3
Robot exits pickup area and starts to move away	0	1	2	3
Cube removed from storage area and placed in pickup area	1	1	1	3
Robot places cube into storage	1	0	2	3
Robot returns to pickup	1	0	2	3
Robot picks up cube	0	1	2	3
…				