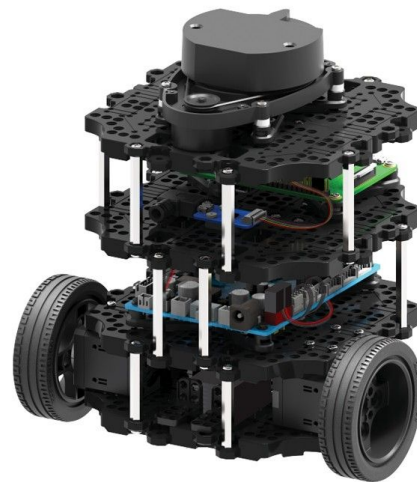# RBE 3002 Final Project

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Project Overview

- Utilize ROS and the gmapping function to perform SLAM
  - Map Expansion
  - Frontier Finding and Grouping
  - A* pathfinding
  - Driving
  - Higher Level Controller

Map Expansion

- 0.015m cell size
- Corners are chamfered
- Expansion is done by alternating with a 4-neighbor and 8 neighbor approach
- Buffer size is slightly larger than the Radius of the Robot
- Slight cost map on cells after the buffer
- Ignores single cell obstacles
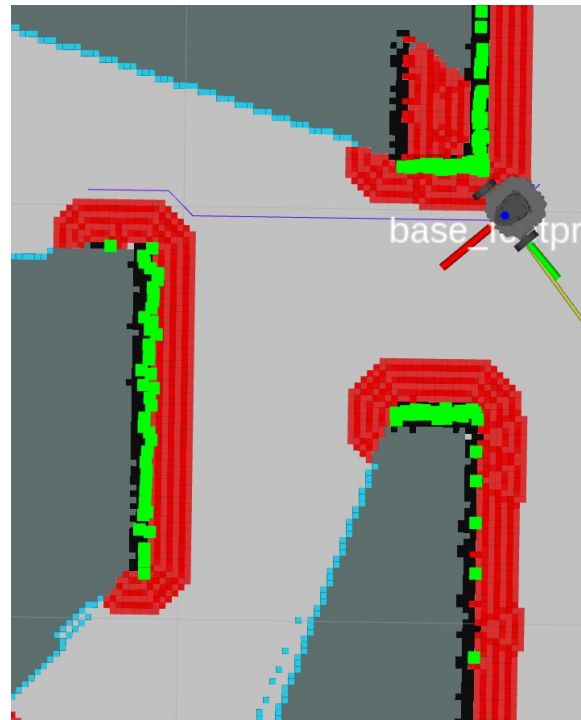
Frontier Exploration/Grouping

- Frontiers cells are grouped and all of the midpoints are sent to the controller in an array
- The frontier with the closest midpoint based on euclidean distance is selected
- A* generates a path to the frontier with the closest midpoint
- If the frontier can't be reached, it's removed from the list and the next closest is used
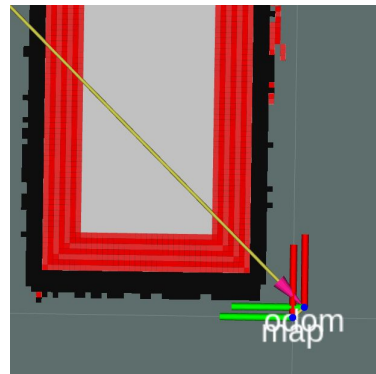
A*

- Uses angular cost and linear cost to find a path and Euclidean heuristic
- Will also travel at 45 degree angles
- Reduces redundant waypoints in 0.4 meter increments
- If the start node is invalid, it will correct the start by finding the first open space in a buffer size cell radius
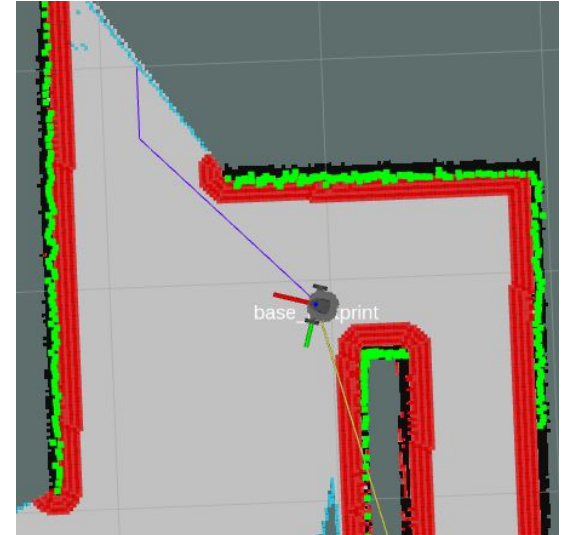
Driving

- Drive node would get its current location using tf transform
- The end location is passed in from the controller as a path which the robot will execute
- The robot will rotate to face the end goal and then drive straight to it

Controller

Drive to NavGoal

If 2D Nav Goal is given

Controller

Default operation

Get Frontiers Centroids

Get Closest Centroid

If Path Fails

Attempt to Path to Centroid

If List of Centroids is Empty

Path Generated

Drive to First Waypoint in path

Go Home