

Objectives: Enhanced robot pathfinding on Prime Vision floorplans using deep reinforcement learning.

Completed works:

1. Incorporated the floorplans into the reinforcement learning simulation environment.

FPEnv.py parses the floorplan JSON file to get nodes and edges, generates the adjacency matrix, and then creates the reinforcement learning environment

2. Trained the attention models with the autoregressive policy on real floorplans and tuned the parameters for better performance.

(1) Trained the attention models on both grid maps and Butterfly 14x11 floorplan.

(2) Tuned various parameters to improve the model performance:

a. Allow temporary loops in training and testing, set the maximum number of steps to a higher limit (1000), set the max epochs in training to a higher number (200)

b. Apply gradient clipping to avoid gradient exploding

c. Tune the batch size to an appropriate number

d. Tune the decode type (training, validation, testing) in the policy

In-progress Works:

1. Improve the policy to avoid the robots being stuck in the loop during training and testing.

(1) Explore other decode strategies (e.g. multistart_greedy, multistart_sampling)

(2) Detect if the robot is stuck in loops; if so, choose an unvisited neighbor from a node if there is a choice

2. Develop vectorized environments to train the robot in different environments (grid map + real floorplans)

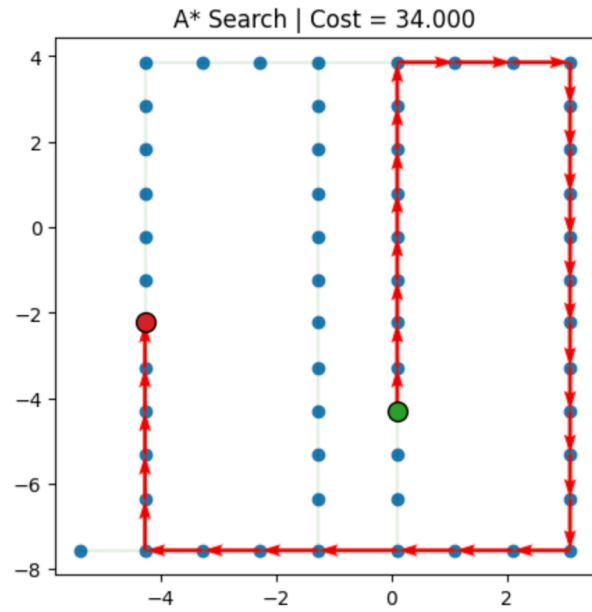
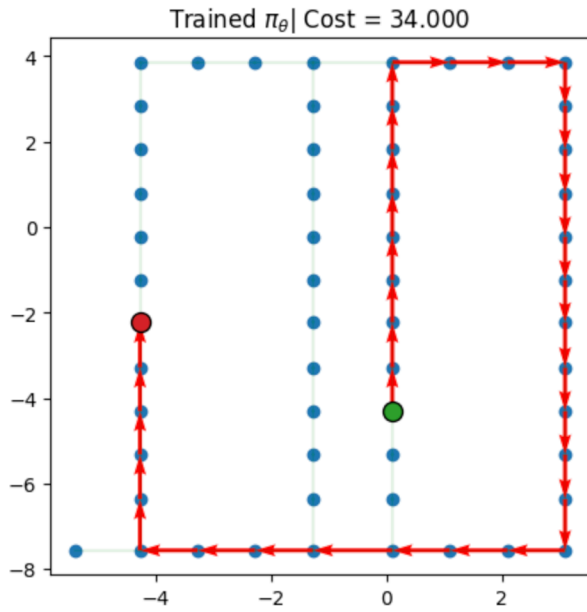
Explore if training on several representative floorplans and grid maps combined can improve the generalization ability of the model

3. Explore the moving obstacles problem to avoid crashing into other moving robots.

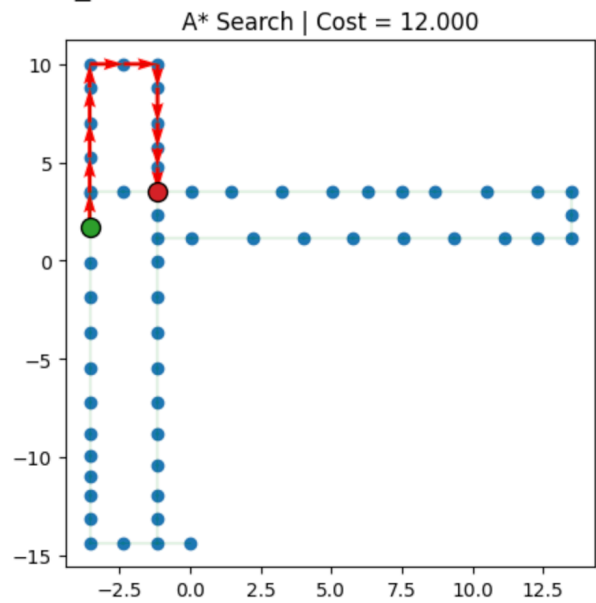
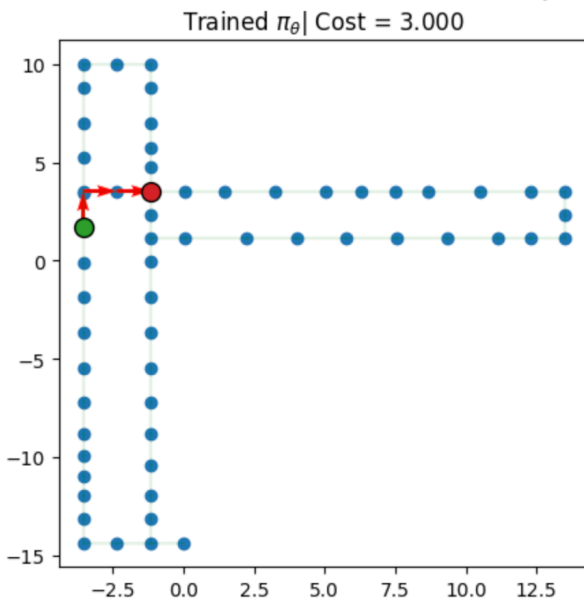
Currently, the environment does not account for other moving robots. However, robot congestions happen frequently in reality.

Current Results:

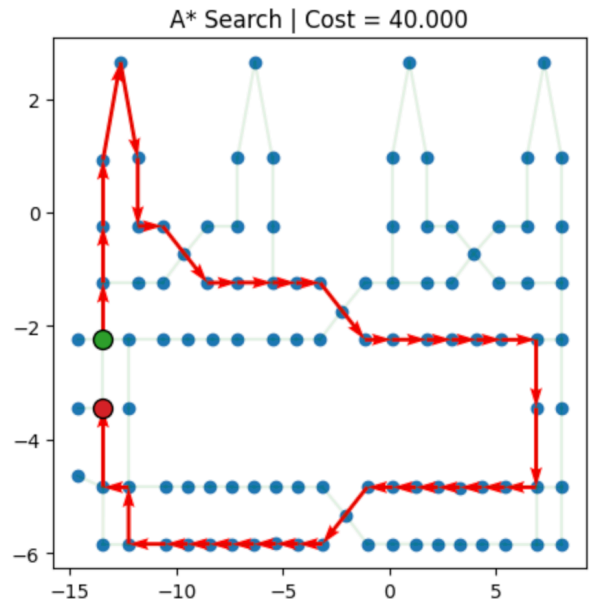
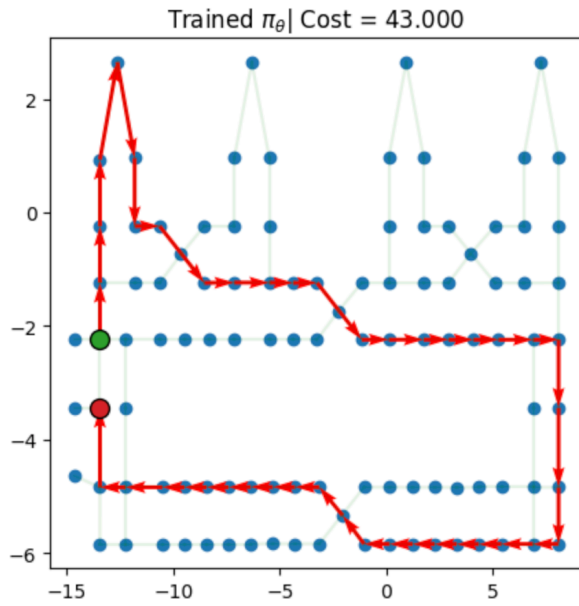
Floorplan: 0001_Colorado_Springs



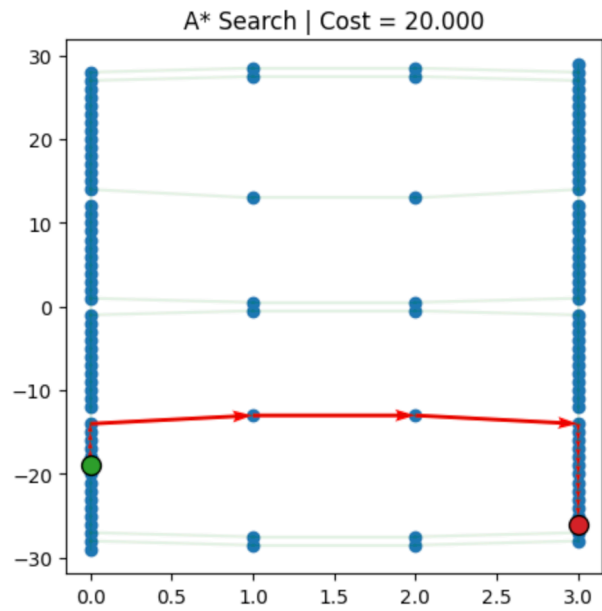
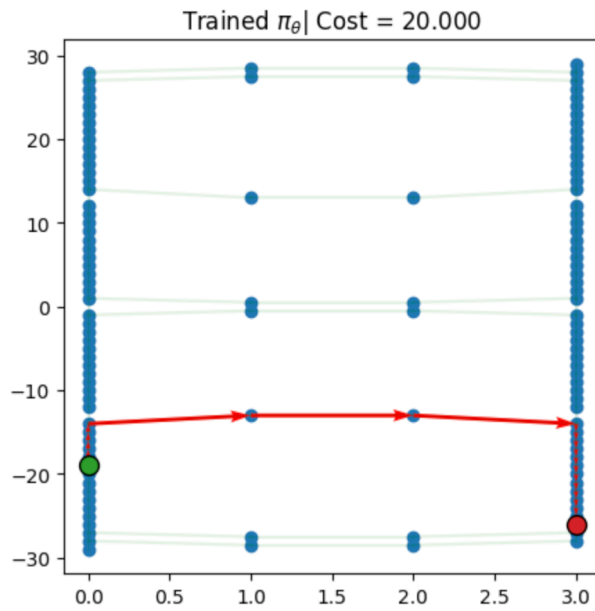
Floorplan: 0021_FDR



Floorplan: fp-factory



Floorplan: Long Plan Ends



Floorplan: unstable

