

Rapidly Exploring Random Trees Documentation

Rose Gebhardt

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1 Code Structure

- **graph.h** is used to create a graph class, which defines vertex and edge attributes and stores them in the proper form. The graph class has functions for finding the vertex closest to a given (x, y) position, for creating a new node and edge given the position and originating vertex, and for saving the path and search tree to text files that can be read as **.csv** files.
- **rrt.cpp** uses the graph structure, a collision detection function, and a goal region detection function to implement the rapidly-exploring random trees (RRT) algorithm for each problem. It finds a path from a given starting position to a given goal region using a given step size and outputs the path and search tree to a text file.
- **results.m** plots the search tree, the path found, the start node, the goal region, and the obstacles. It then saves the figure corresponding to each problem as a **.png** image.

To get the search path and optimal path in a text file, run **./run_rrt** in terminal. To plot these results, run the **results.m** MATLAB script.

2 Results

Results from each problem are shown below. The red cross indicates the starting position, the red circle indicates the goal region, the areas filled in black are obstacles, the blue line is the search tree, and the red dashed line is the path found. Each case had a solution, but if no solution was found in an allotted number of tries it would be indicated in the terminal when running the executable.



