

LAB 4: Path Planning (Simulation)

Due: 10/31 at 3:00 pm (along with robot portion)

The purpose of lab 4 is to develop your own pathfinding capabilities for Cozmo. In this first part you will implement the RRT algorithm for searching in a simulated environment, and in the next part you will be incorporating this with Cozmo to help it explore a physical environment. We are giving you extra time to complete this part before moving on to the robot portion, but you will submit all your code for both parts together at the end. For this part, you will complete the following methods in `rrt.py`:

- `step_from_to`: This method will take 2 nodes and return the second if the distance between them is less than the `limit`, or it will return a new node along the same line but `limit` distance away from the first node.
- `node_generator`: This method will return a randomly generated node, uniformly distributed within the map boundaries and avoiding any obstacles.
- `RRT`: The main method for RRT, we have provided a framework but you must complete the main loop by generating random nodes and assembling them into a tree in accordance with the algorithm. Goal detection, tracking parents, and generating the final path is already done for you as part of the `cmap.py` methods.

The file `utils.py` contains some general useful methods, as well as the definition of the `Node` class, and `cmap.py` contains some useful methods related to the map representation, so it is worth familiarizing yourself with these files though you will not be editing them.

We have provided you with 3 maps for testing purposes, located in the `maps` folder. You can run the algorithm on one map with a graphical visualizer by executing `rrt.py` (you can change the map in the main method at the bottom of the file), or you can run the algorithm on all 3 maps at once without the visualizer by executing `python autograder.py gradecase1.json`.

Evaluation: This part will be autograded using the 3 maps we have given you, as well as 3 new maps similar in layout to the ones we've given you. You will receive 10 points per map successfully solved, for a total of 60 points (the remaining 40 will come from the robot portion).

Submission: This portion will be submitted along with the robot portion before class on the day of the demo. Full submission details will be included in the instructions for the robot portion.