CSCI 3302: Introduction to Robotics
Homework 3: Probabilistic Motion Planning with RRT

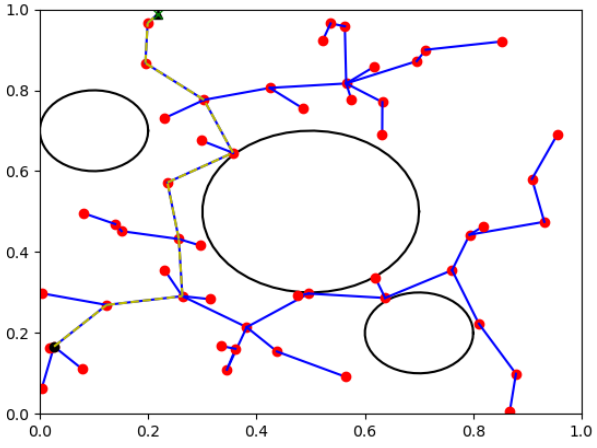
Due Date: Dec 7th, 2020 @ 11:59pm

RRT is a probabilistic search technique that can be used with rapid effectiveness in the high-dimensional, continuous environments common to robotics problems. In this assignment, you will implement the RRT algorithm for holonomic robots in the 2D plane.

Using the provided base code, implement the RRT algorithm. You may use numpy or any math library you prefer, though this is not strictly necessary. **You are not permitted to call RRT-like functions from other packages to implement your own (i.e., you may not just write a wrapper that calls someone else's implementations)**.

The provided Python file will run your algorithm on four 2D domains: two without a goal, and two with a goal specified. The output will be saved into four plots (rrt_run1.png, rrt_run2.png, rrt_goal_run1.png, rrt_goal_run2.png)

You are to complete this assignment on your own (without collaboration).



A successful implementation of RRT will look similar to this plot: your vertices will all be connected to each other, with no single edge being longer than Δq, a parameter passed in to your algorithm. In this example, a goal location was given (the triangle at the top-left of the plot) and the path from start vertex (black circle in the bottom-left) to goal vertex is shown in yellow/blue.

Reminder: If goal_point is not None, set q_rand to goal_point some small percentage of the time (e.g., if random.random() < 0.05: q_rand = goal)!

Approximate Time to Complete: 120 minutes. Please reach out for help if you find yourself stuck or spending more time than this on the assignment!

To Submit: Turn in your fully implemented CSCI3302_hw3_rrt.py file and the four image files that it generates to Canvas.