Intelligent Control Systems Spring 2016 – Homework 5

Due at 4:00 p.m. on April 18, 2018
100 points

This is a Matlab homework assignment. You will create a file called "YOURLASTNAMEhw5RRT.m" and submit that file on Blackboard. Your file will do everything described in the problem statement on the next page. Do not submit any other .m files. Also copy the text in your .m file into a single .docx or .pdf file and submit this file that is readable by Blackboard's plagarism software. The grading will be as follows:

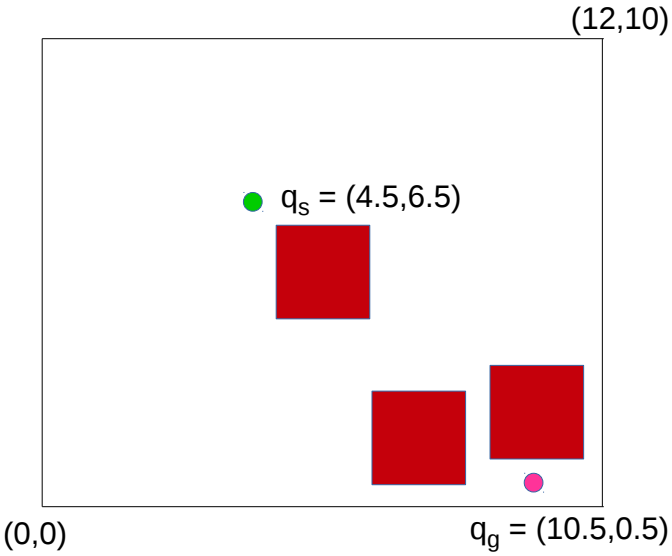
- 100 points = correct solution
- 75 points = mostly correct solution
- 50 points = a good attempt, but significant improvements needed
- 25 points = a seriously flawed submission
- 0 points = no submission or failure to follow the submission instructions above

If you submit your homework on time or within your remaining late homework days, you will be given the chance to resubmit your solution if you did not get a score of 100. You will receive feedback and will need to resubmit by the deadline for the next homework assignment.

Please respect the rules on academic misconduct described in the course syllabus.

Problem 1:

Solve the following planning problem using an RRT. For a point robot in the 2D space pictured below find a path from $q_s = (4.5, 6.5)$ (green circle) to $q_g = (10.5, 0.5)$ (pink circle) while avoiding the obstacles (red squares). The obstacles are two units on each side and have centers at (6,5), (8.5,1.5), and (10.5,2). If you want, you may use a bidirectional RRT that builds two trees, one rooted at the start point and one rooted at the goal point. Stop expanding your tree when the Euclidean distance between the goal and a point on the tree is less than 0.1.



(a) Plot the tree. Have you code make a plot of the space including the obstacles. Plot the start point as a green circle and the goal point as a magenta (color 'm' in Matlab) circle. Plot all edges on the tree as blue lines. Plot the path connecting the start and goal points as green lines.

(b) Report vertices. Report the number of vertices in your tree on the command line using `display(['vertices =',num2str(vertices)])`.

(c) Report edges. Report the number of edges in the path connecting the start and goal points on the command line using `display(['edges =',num2str(edges)])`.