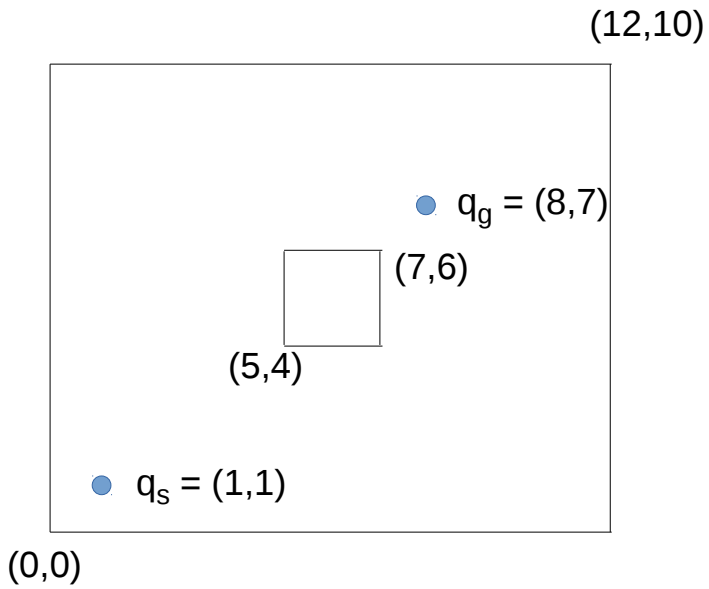
Intelligent Control – Interactive Session on Rapidly-Exploring Random Trees

March 28, 2018

Problem 1:

Solve the following planning problem using an RRT. For a point robot in the 2D space pictured below find a path from $q_s = (1, 1)$ to $q_g = (8, 7)$ while avoiding the square obstacle in the middle of the space.



(a) Open a figure. Plot the world picuted above in Matlab.

(b) Expand the tree. Expand your tree from the start configuration and plot all edges. Don't worry about collisions yet. Here are things you will need in your code:

- a structure to record edges, vertices, and parents of vertices in the tree
- a structure to record edges and vertices of the obstacles
- a condition for stopping expansion of the tree - typically when the newest vertex is within a certain distance of the target

- a way to find the nearest vertex in the tree to the current randonly-selected configuration - try using `knnsearch()`.

(c) Search the tree. Plot the path from the initial configuration to the goal configuration. You will need a way to search your tree for parent nodes. You might use the Matlab command `find()` to do this.

(d) Add collision detection. Repeat (b) and (c) by making sure your edges avoid the obstacle. Here are things you will need in your code:

- a way to check if a point is inside the obstacle - try using `inpolygon()`
- a way to check points along a line from the nearest vertex in the tree to your randomly-selected point