

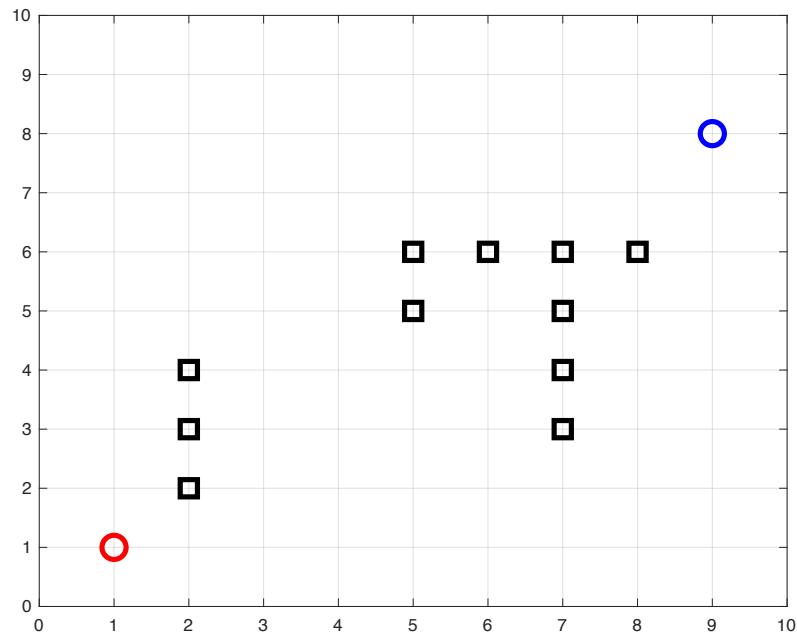
ME 459/5559 – Robotics and Unmanned Systems
HW #3: DUE September 14th, 2022

LATE HOMEWORK WILL BE DEDUCTED 10% PER DAY AFTER THE DUE DATE

Problem 1:

Given the map below, and a grid spacing of 1, use A* to compute the path **(by hand)** from start to finish (start = red, goal = blue, obstacles = black).

Show your work (i.e. show the travel cost, heuristic cost, and total cost for each node visited).



Problem 2:

Modify your Dijkstra's software to run the A* algorithm. This should require only small modifications to the cost estimate for each cell. Given the grid information and biggrid.csv, find the path (provide total travel cost) get from the start to the goal.

Grid boundaries: 50x50 with grid spacing = 0.5

Start Location: [49, 0.5]

Goal Location: [0.5, 49]

Numpy is a good method for reading in the csv file.

Note: IT IS HIGHLY RECOMMENDED TO TRY YOUR A* ALGORITHM ON A SMALLER GRAPH BEFORE ATTEMPTING THIS PROBLEM

Run this large graph with both Dijkstra's and A*, compare the total time to compute. Dijkstras may take quite some time to run (recommended to turn off plotting to speed up the process).

Submit your Python code.

Problem 3:

Modify your Dijkstra/A* code to use the RRT method to get from the start to the goal. Use the same obstacle list and bounding box as Problem 2. Use a distance to jump (from nearest node in the tree) of 0.5.

Create a plot showing the tree (valid nodes) and the corresponding path to get from the start to the goal for the same map as Problem 2.

Provide the computation time, and compare to Problem 2.

Submit your Python code.