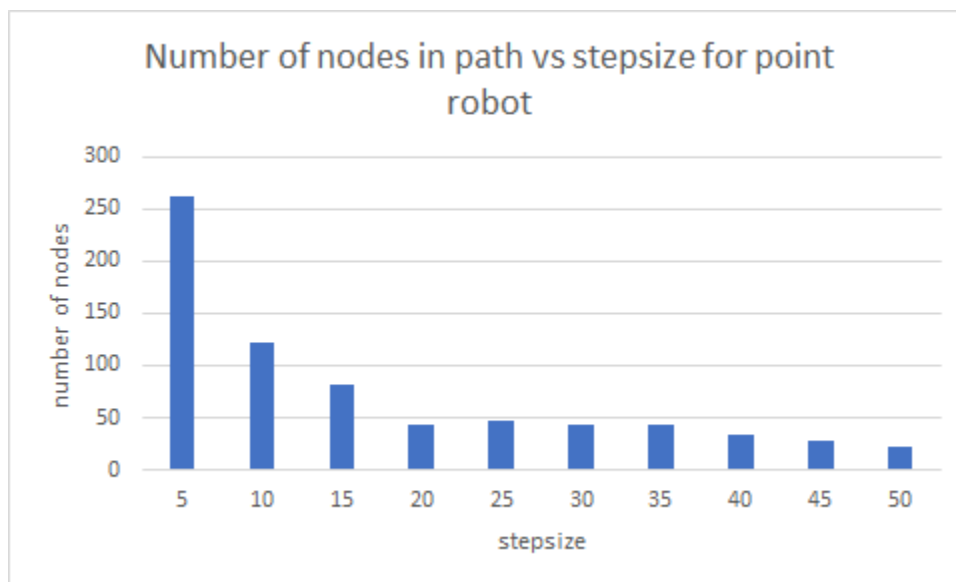


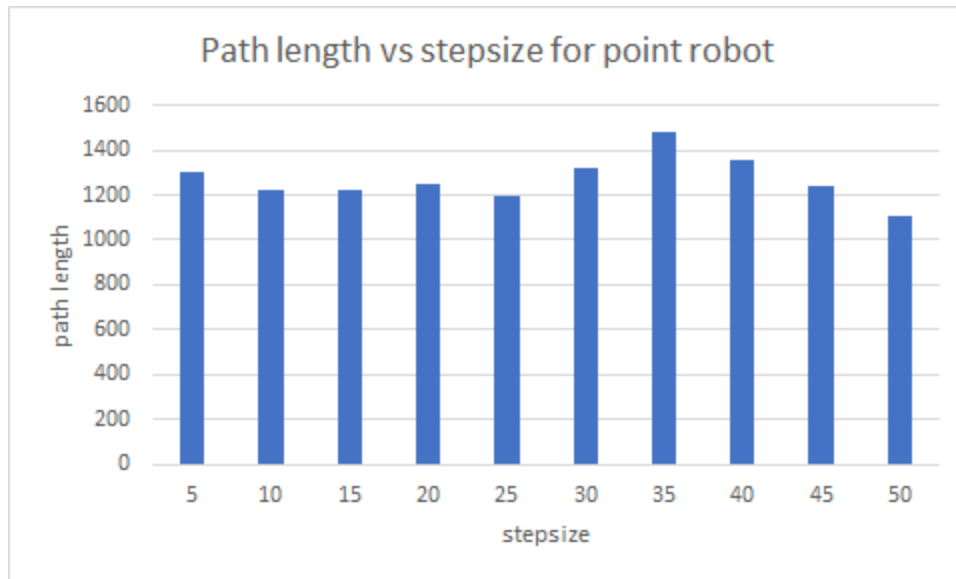
Point Robot Commentary

For a given step size, the use of Gaussian sampling seems to yield a path towards the target position quicker than uniform sampling. Less iterations/nodes are used to find the target as the path-finding using Gaussian sampling is biased towards the target position.

I ran RRT using Gaussian sampling on the shot.png environment using 10 different step sizes. For the graphs, I have averaged the results over numerous trials. From the graph below, it is evident that the number of nodes in the solution decreases rapidly as the step size increases. This is due to the fact that we take longer strides with a greater step size, and the target position's radius is greater.

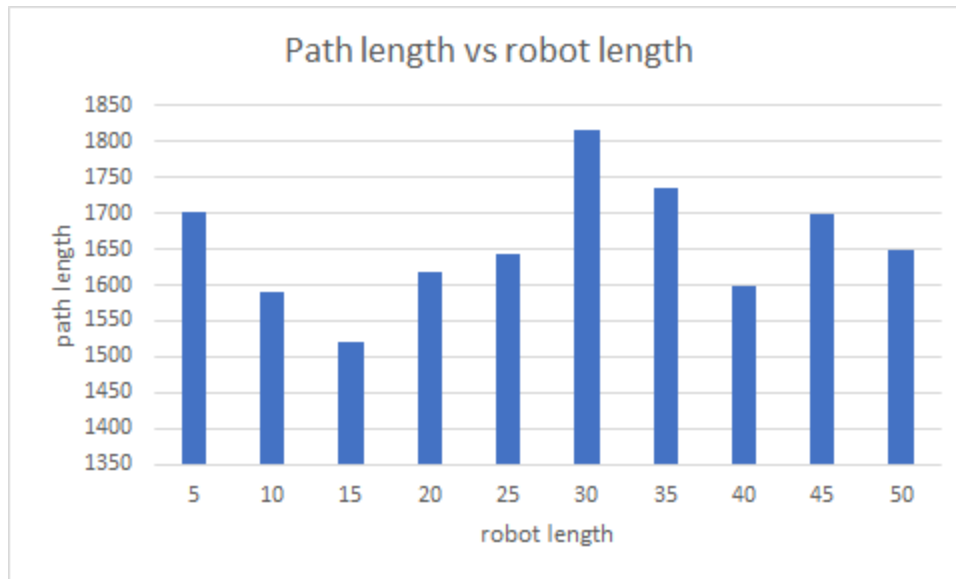


On the other hand, the path length decreases slower as the step size increases. There are variations, but there is a downwards trend towards the end. A stepsize of 25 seems reasonable for this experiment as it balances the tradeoffs of travelling a greater length due to a greater stepsize, and minimizes the number of nodes in the solution.



Line Robot Commentary

Once the robot reaches the target (x,y) , my code checks for whether the robot may rotate to match the desired end orientation by checking whether there are obstacles in between the rotation. If so, the path is found, otherwise, the algorithm keeps searching. I ran RRT with uniform sampling on the line robot with a target radius of 10. There is a lot of variation in the number of nodes in the solution as the robot length varies. The exact number of nodes will depend not only on the robot length but also on the obstacles themselves, as the robot may have to make awkward turns to fit into narrow spaces. In those scenarios, a greater robot length may imply a greater number of nodes required, as the robot needs to make more turns to “park” itself into these spaces. Please see the next page for the path length vs robot length graph.



Difficulties

Initially, I had a few issues implementing the RRT algorithm as it is. I don't come from a python background, and this assignment was my first time being exposed to the language, so I wasn't fully adapted to it. For instance, it took me a very long time to learn how to set up the environment with Python 2.7 using Anaconda. I greatly appreciated the deadline extension, as the earlier version of the assignment that I had submitted had more flaws. The extra few days allowed me to properly instruct myself on Python and implement a better solution.