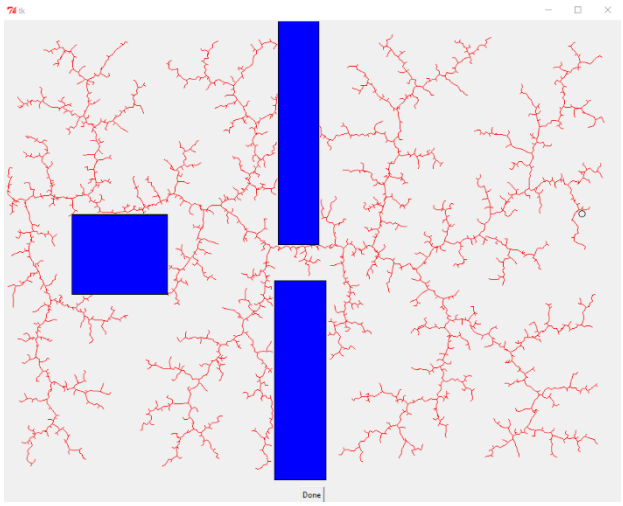
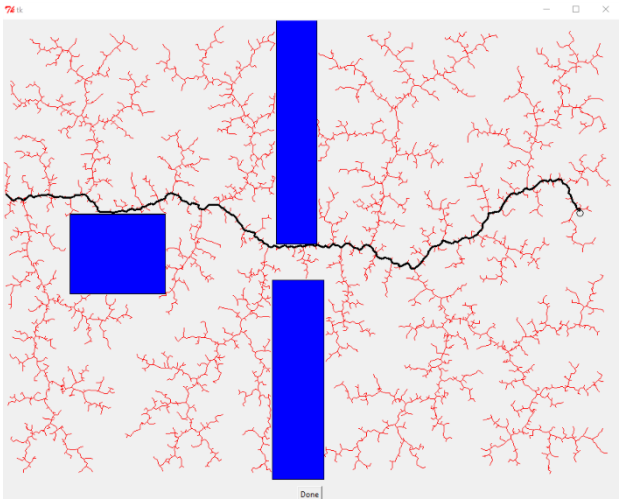
Nikita Rudin
260809135

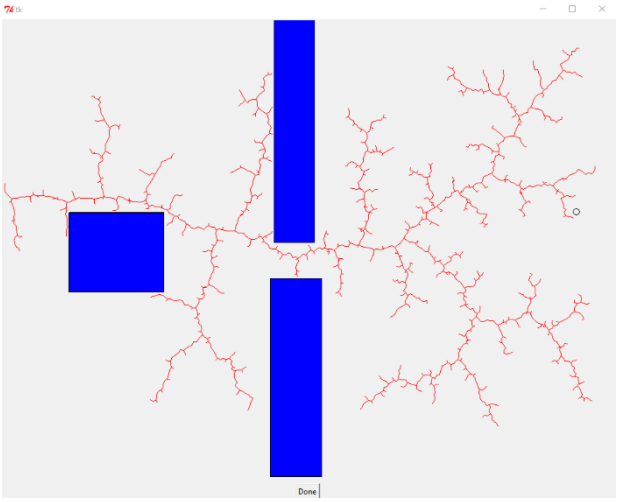
COMP 417 Assignment 2 -RRT Planner

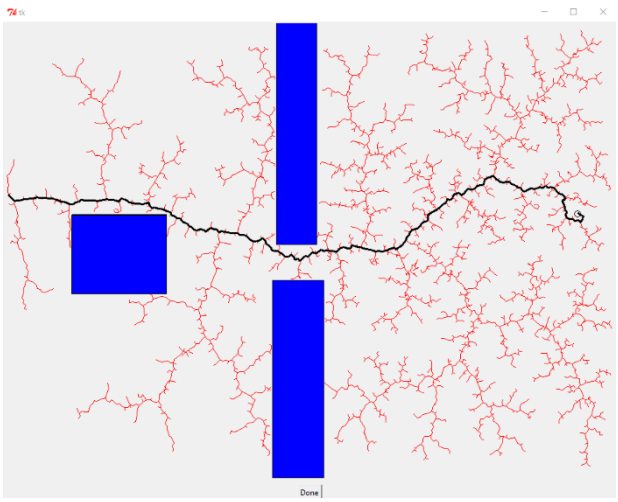
1.a Uniform distribution





1.b Gaussian distribution with sigma = X_Y MAX/2





Changing the sampling distribution can dramatically affect the planner. One big issue with a uniform distribution is the fact that nothing attracts the tree towards the goal, by making a gaussian centered at the target we increase the chance of going in the right general direction. An other issue is that that once a branch of the tree is close to the target it can still take a lot of time to make the last step. A gaussian distribution only partially solves this problem.

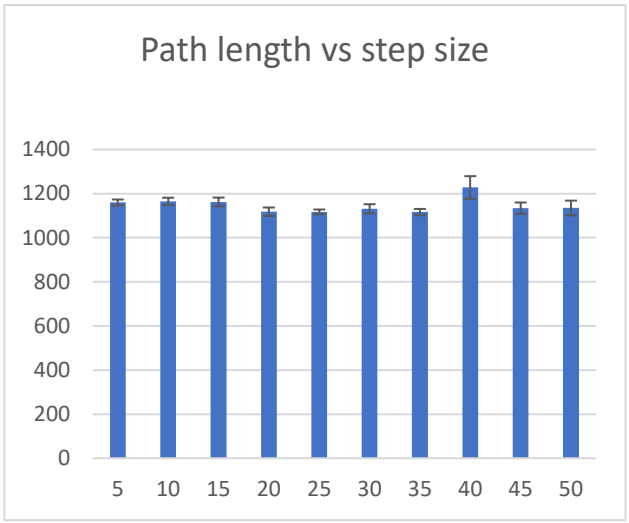
A solution which seems to work pretty well is to narrow the gaussian as the tree approaches the target, by setting the standard deviation to the distance to the target. This works really well in the provided worlds, but can lead to other issues in other cases, for example if the tree is close to the target, but still needs to go around a wall.

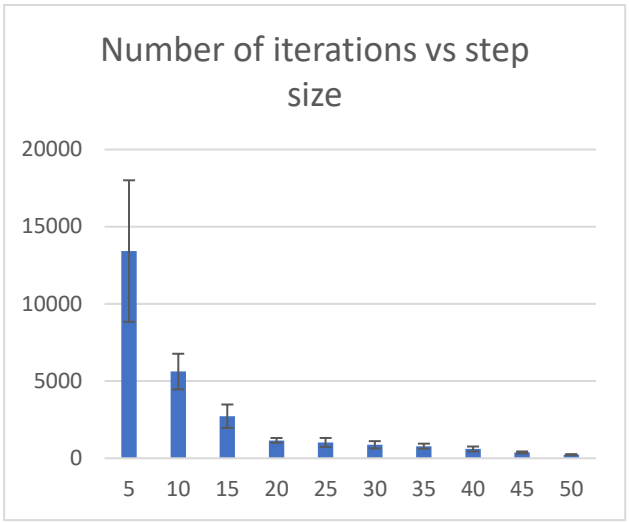
1.c

I varied the step size from 5 to 50. I checked visually that a step of 50 still provides good results in world1. It is too big for the example_world because the step gets bigger than small obstacles.

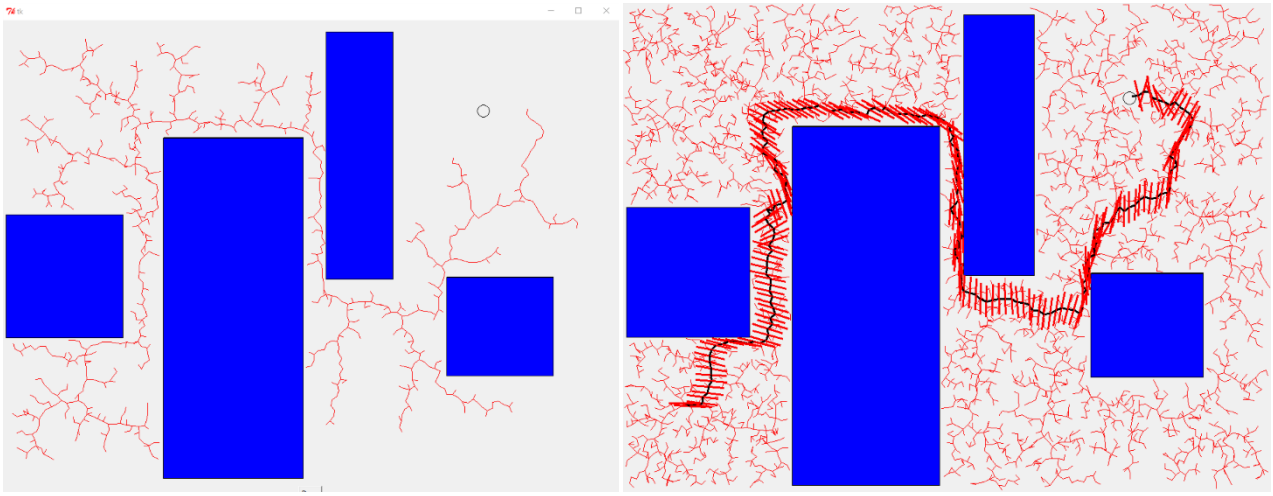
The path length remains stable, while the number of iterations drops as the step size increases (note: the target has the same size as the step).I think a step size of 20 will give a good number of iterations, while still being small enough to not jump over obstacles.

Nikita Rudin
260809135





2.a



2.b

As the length of the robot increases the RRT will need more iterations. This is because as the robot gets longer there will be more and more collisions with the obstacles (the free space gets smaller).

We can see that in average the number of iterations increases with the length. The decreases around 20-30 is probably due to random results.