CSCI 545 HW4

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1. Why is the path returned by the RRT not guaranteed to be optimal (i.e. not the shortest feasible path)?
   RRT makes no attempt to move specifically towards the goal, it makes random steps that eventually end up moving to the goal (prioritizes exploration), therefore makes no assumption of optimality. As you see in practice, the edges are often jagged and make random moves to end up at the goal, there are certain variants that try to help this.

2. What effect will increasing δ have on the performance of the RRT?
   Similar to a learning rate in gradient descent, a smaller δ leads to a smoother path, but takes a lot longer. A larger δ would be much faster, but it might not be able to move into certain locations due to obstacles, and will have a longer path to goal.

3. What effect will increasing the bounds of the search space have on the performance of the RRT? How about increasing the number of dimensions of the search space?
   Increasing the bounds of the search space cam slow down RRT, as it will explore more area, but it could find new solutions utilizing the new space. Increasing the number of dimensions increases the computation exponentially, due to the curse of dimensionality, where at higher dimensions, it takes a lot more samples to effectively fill the space.

4. Why is it important to have a relatively small δ?
   Similar to learning rate, if δ is too large, you take large steps that could overshoot the goal, or make it very difficult to fit into tight gaps.

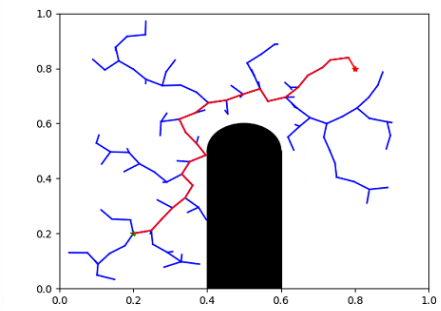

Figure 1: An example of the RRT running with step size of 0.05