CS 284 PSET 4

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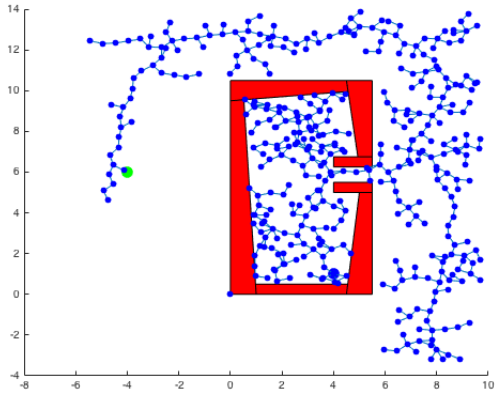
April 1, 2016

IF YOU HAVE ANY PROBLEMS RUNNING THE CODE, PLEASE EMAIL ME.

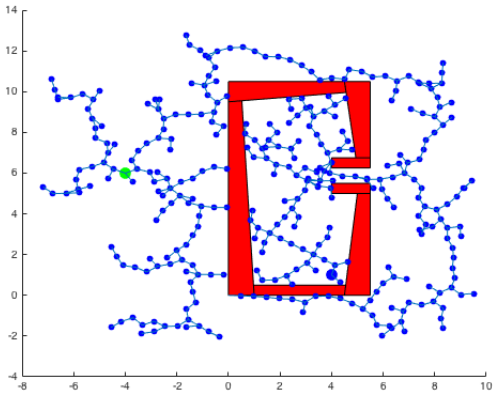
Problem 1

I obtain the following total number of vertices for one direction RRT. 527, 532, 567, 407, 450, 520, 489, 585, 753, 398



Problem 2

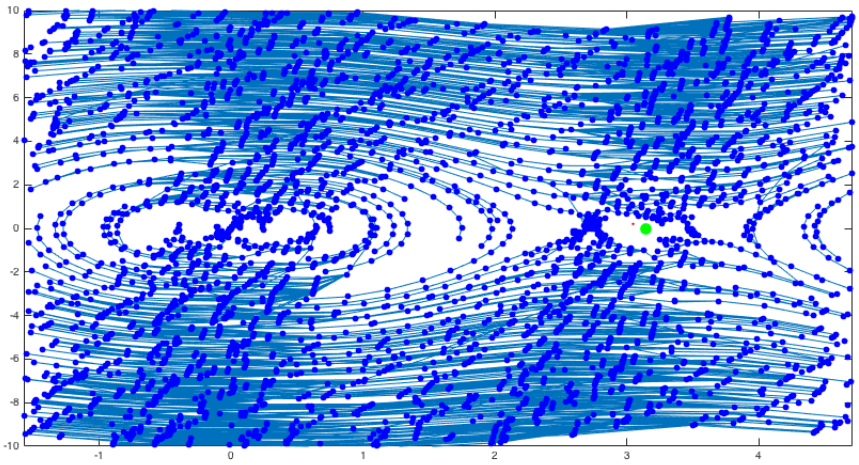
I obtain the following total number of vertices for bi direction RRT. 239, 165, 132, 185, 93, 159, 134, 134, 241, 274.



Problem 3

part a: The difficulty is that there are two distances between two angles. That is why we constrain angles to be between $-\pi/2$ and $3\pi/2$. $(-2, 1)$ is then $(4.28, 1)$ and $(4, 3)$ remains $(4, 3)$. The euclidean distance is then $\sqrt{.28^2 + 2^2} = 2.02$

part b: The performance seems not as efficient and not as reliable. The closest euclidean vertex is not the best vertex to be shooting from. The runtime is noticeably longer than RRT-LQR, and many more vertices are generated. The final path has an abrupt turn in it nearing the goal, whilst the trajectory for LQR is much smoother. I've attached the RRT tree for inspection.



part c: We first linearize the dynamics about $x_0 = [\pi - 0.1, 2.0]$. This produces $A =$ [0 1; -9.8*cos(xy(1)) -0.1] =

$[01.0000; 9.7495 - 0.1000]$ and $B = [0; 1]$. We are computing the distance from $x = [3.14 + 0.25; 3.0]$. The S matrix from LQR is $[7.34561.9999; 1.99990.6972]$. Then $(x - x_0)^T S(x - x_0) = 3.0$

part d: I've attached all the figures and the code.