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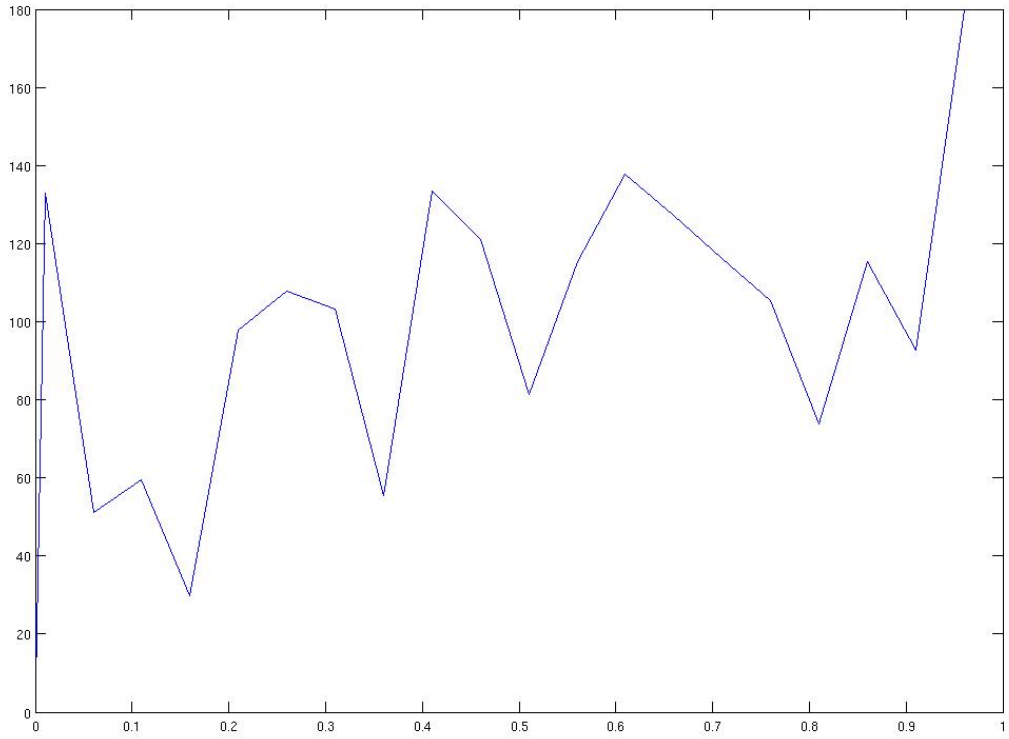
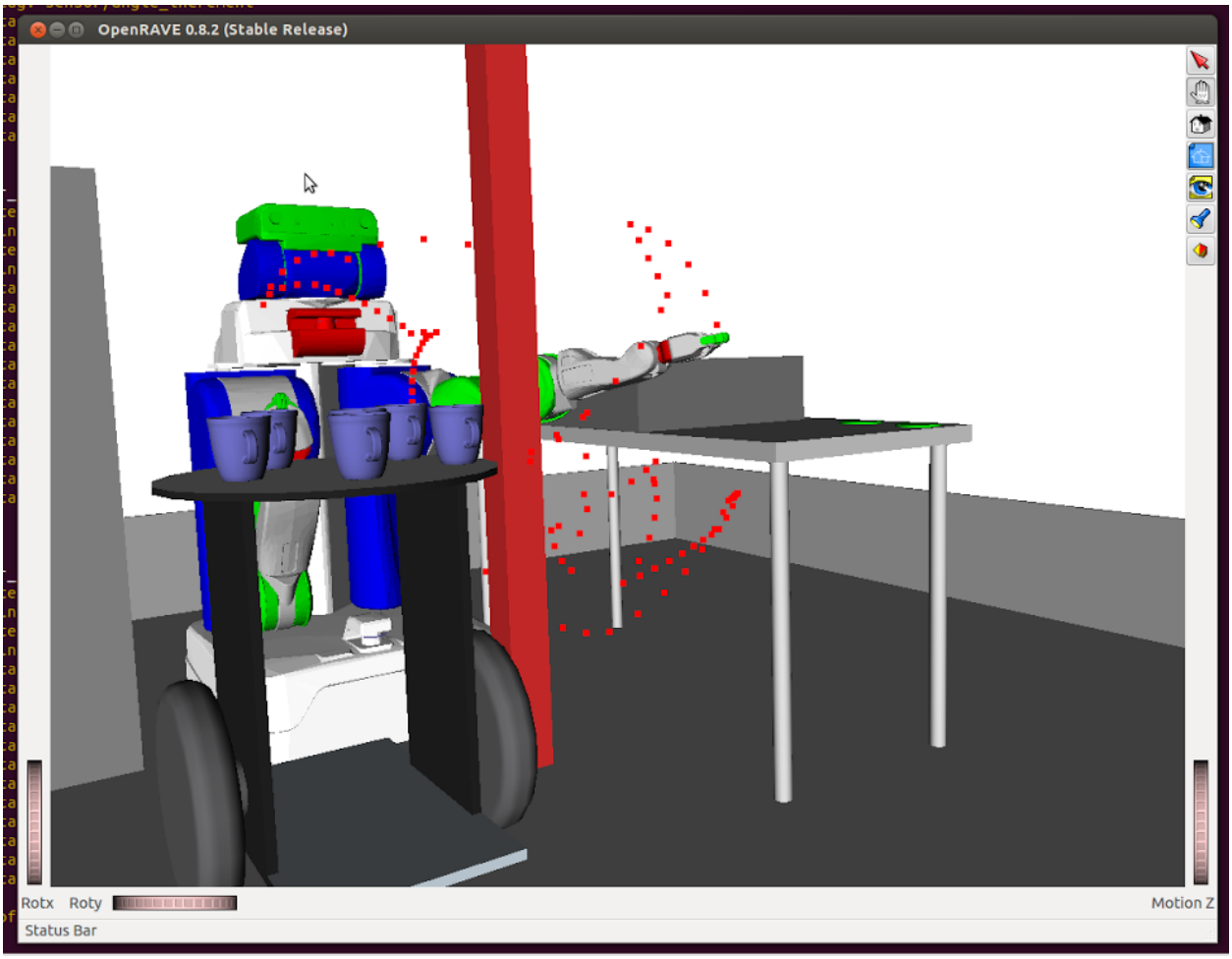
CS 525 HW3 Writeup

1.) Goal Bias vs Computation Time Plot



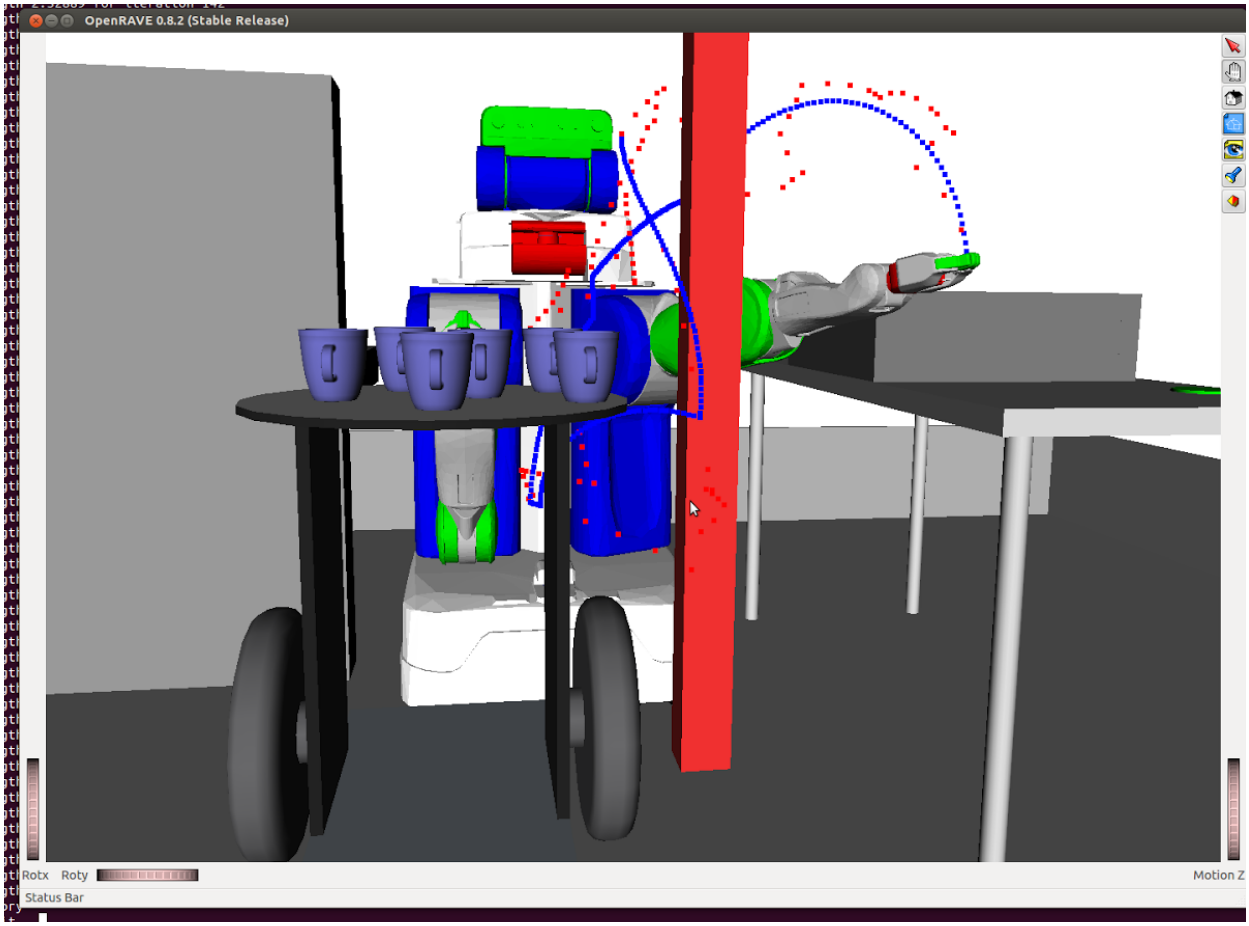
Best goal bias = 0.16.
I believe that the plot looks this way because higher goal biases spend too much time actively expanding the tree and not trying to get to the goal, while lower goal biases try to get to the goal too often without having enough nodes to connect to the goal with.

2.)

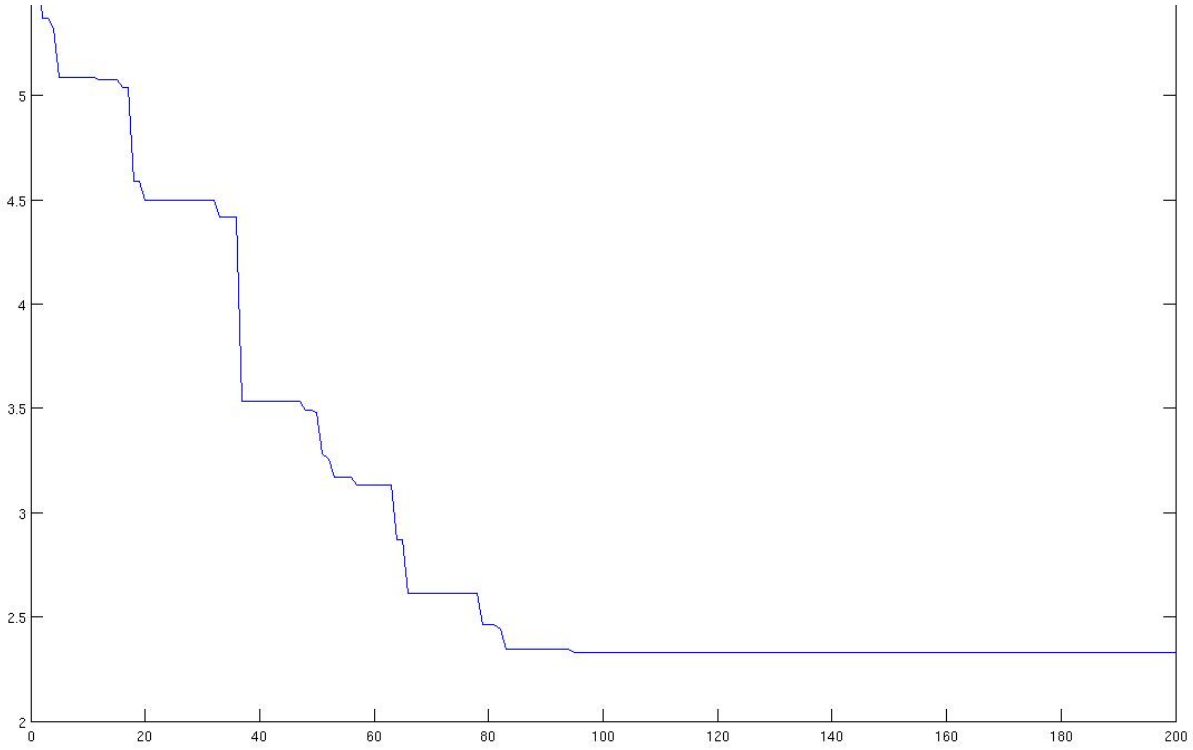


Screenshot of unsmoothed path with goal bias = 0.16

3.)



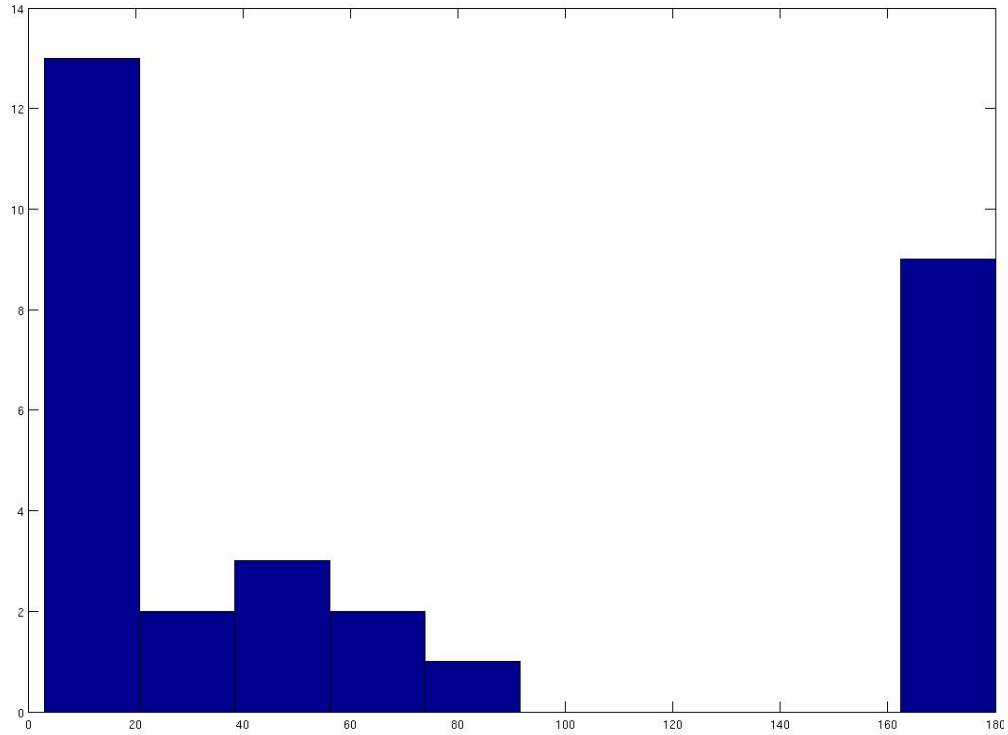
Path for smoothed trajectory with goal bias 0.16



Lengths (Y) *Iterations* (X)

Plot for path lengths over smoothing iterations.

4.)



$Runs(Y)$

$Seconds(X)$

for Histogram RRT runs using goal bias = 0.16

Table for 30 runs

RRT Time (Secs)	Num Nodes	Smoothing Time (Secs)	Path length before	Path length after
180	21573	N/A	N/A	N/A
5	1378	7	6.99024	2.8022
22	5941	6	7.54316	2.93517
180	21562	N/A	N/A	N/A
3	1038	6	4.64801	1.94908
180	21405	N/A	N/A	N/A
68	12193	7	5.80273	3.71914
43	9299	5	7.27787	4.39535
5	1838	7	6.29766	3.74905
8	2691	6	5.50512	3.12182
67	12344	7	5.38663	2.46329

180	21249	N/A	N/A	N/A
180	21237	N/A	N/A	N/A
85	14105	6	7.90455	3.00631
39	8676	7	5.18307	3.25661
54	10435	7	6.08118	2.7267
6	1478	6	6.76414	3.97911
180	21579	N/A	N/A	N/A
13	4098	6	7.03113	3.06531
180	21497	N/A	N/A	N/A
18	5216	6	5.76579	3.45568
18	5224	7	3.5562	2.11355
33	7672	4	5.14153	3.12236
5	5482	4	8.63346	3.53655
180	21562	N/A	N/A	N/A
19	5482	4	8.63346	3.53655
6	1823	4	4.97933	2.48102
11	3576	5	6.39365	3.02794
7	2362	8	7.37868	4.04847
180	21497	N/A	N/A	N/A

Means and Variance: (N/A values not counted due to TLE)
RRT runtime: mean = 71.8333, variance = 5.6057e+03
Node counts: mean = 1.0517e+04, variance = 6.4180e+07
Smoothing runtime: mean = 5.9524, variance = 1.4476
Standard path length: mean = 6.3285, variance = 1.7493

Smoothed path length: mean = 3.1663, variance = 0.3976

From these results, we can see that the goal bias has a relatively good success rate and run time, as the run time mean and variance get pulled up by the time out values. It also shows that the number of nodes generated is not indicative of the smoothing procedure runtime and the path lengths obtained.