

DeepNav: Learning to Navigate Large Cities

Supplementary Material

Samarth Brahmbhatt
Georgia Institute of Technology
Atlanta USA
`samarth.robo@gatech.edu`

James Hays
Georgia Institute of Technology
Atlanta USA
`hays@gatech.edu`

Tables 1 and 2 show the success rate and average number of steps for successful trial metrics for $d_s=690\text{m}$, while Tables 3 and 4 show the metrics for $d_s=970\text{m}$. Figure 1 shows the progression of breadth-first enumeration while constructing the city graph for San Francisco.

Method	Dallas					New York					Phoenix					San Francisco					Mean
	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	
Random walk	12.59	22.47	27.65	8.41	18.67	44.07	42.74	19.42	34.39	33.12	12.50	18.01	17.29	13.50	10.98	39.38	41.48	32.10	23.88	17.64	24.52
A*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
HOG+SVR [1]	25.93	44.58	46.96	18.18	26.67	66.94	67.74	46.38	55.14	52.29	25.00	30.88	46.99	37.14	13.73	62.50	62.68	58.52	44.90	26.42	42.98
DeepNav-distance	37.04	56.63	53.04	40.91	24.44	70.97	66.67	50.72	60.75	55.05	40.00	50.00	36.14	42.86	17.65	59.38	68.42	57.95	47.96	39.62	48.81
DeepNav-direction	25.93	27.71	34.78	4.55	15.56	54.84	39.78	53.62	50.47	52.29	20.00	25.00	54.22	35.71	25.49	50.00	47.37	42.05	30.61	16.98	35.35
DeepNav-pair	18.52	38.55	69.57	31.82	42.22	68.55	60.22	56.52	47.66	66.97	25.00	30.88	53.01	41.43	27.45	65.63	63.16	56.82	43.88	30.19	46.90

Table 1: Success rate of various DeepNav agents compared with random walker, A* and the agent from [1], $d_s = 690m$

Method	Dallas					New York					Phoenix					San Francisco					Mean
	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	
Random walk	458.35	408.98	408.98	450.05	488.05	344.27	338.32	508.39	429.59	405.93	496.74	472.43	486.31	471.86	523.39	298.14	373.56	399.16	406.98	463.69	431.66
A*	29.22	25.58	25.58	34.41	28.89	21.85	22.55	26.84	24.17	23.83	28.95	30.31	27.77	33.21	37.16	23.18	22.55	0.00	0.00	0.00	23.30
HOG+SVR [1]	465.71	417.65	349.94	283.50	280.75	279.28	293.33	323.91	325.07	282.28	282.80	261.81	334.74	265.73	254.71	249.45	336.91	320.02	323.80	374.93	315.32
DeepNav-distance	519.80	349.06	413.03	314.67	463.91	354.48	316.48	350.34	375.23	379.45	443.00	282.21	347.23	306.93	414.11	282.84	318.82	329.16	288.30	389.62	361.93
DeepNav-direction	122.71	118.87	104.03	45.00	80.00	147.57	61.51	161.62	142.93	177.65	190.50	238.47	177.31	175.52	178.92	117.06	136.83	120.16	124.83	164.89	139.32
DeepNav-pair	385.60	368.47	348.93	469.71	360.16	295.04	326.70	444.87	404.61	348.93	335.00	383.14	280.82	389.07	208.79	251.26	305.42	301.54	297.37	322.69	341.41

Table 2: Average number of steps for successful trials, various DeepNav agents compared with random walker, A* and the agent from [1] $d_s = 690m$

Method	Dallas					New York					Phoenix					San Francisco					Mean
	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	
Random walk	3.20	20.13	11.22	3.28	13.89	35.32	29.73	10.86	27.29	23.54	5.59	5.00	7.30	5.36	2.79	25.71	29.75	22.21	21.69	8.19	15.60
A*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
HOG+SVR [1]	20.00	26.92	41.44	6.90	20.37	55.20	52.05	34.48	60.64	35.92	23.53	9.43	38.16	26.19	11.76	56.67	56.28	51.96	40.00	21.28	34.46
DeepNav-distance	16.00	57.69	47.75	13.79	22.22	60.80	52.05	41.38	47.87	48.54	17.65	26.42	34.21	28.57	11.76	53.33	56.28	47.49	40.00	21.28	37.25
DeepNav-direction	0.00	23.08	18.92	3.45	14.81	49.60	36.99	46.55	32.98	40.78	17.65	18.87	43.42	38.10	14.71	27.50	37.70	34.08	30.00	6.38	26.78
DeepNav-pair	4.00	34.62	46.85	27.59	40.74	63.20	43.84	46.55	36.17	50.49	17.65	28.30	48.68	33.33	20.59	69.17	47.54	29.41	35.00	17.02	37.04

Table 3: Success rate of various DeepNav agents compared with random walker, A* and the agent from [1], $d_s = 970m$

Method	Dallas					New York					Phoenix					San Francisco					Mean
	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	B	C	G	H	M	
Random walk	311.86	326.99	473.18	341.48	373.88	311.12	346.48	507.58	365.00	377.01	397.99	474.59	576.91	528.45	371.83	366.65	389.50	371.30	292.30	423.85	396.40
A*	47.00	33.47	40.15	46.41	40.91	29.00	30.30	40.57	29.52	32.31	41.71	46.30	43.36	44.12	50.29	32.46	30.69	34.91	36.69	43.49	38.68
HOG+SVR [1]	505.00	337.52	410.61	685.50	361.09	265.73	325.74	425.65	398.77	382.65	630.25	640.20	438.59	403.09	450.25	367.09	413.16	362.71	380.03	422.00	430.28
DeepNav-distance	701.75	347.78	472.38	567.00	442.25	375.66	303.05	421.50	335.11	331.08	428.00	357.93	439.81	338.67	750.25	386.03	398.92	391.45	255.03	426.40	423.50
DeepNav-direction	-	99.67	127.57	82.00	174.75	189.58	81.11	206.11	113.00	155.00	350.67	437.40	213.03	222.69	367.00	124.39	106.38	194.48	152.42	122.33	175.98
DeepNav-pair	716.00	313.74	390.29	615.25	454.91	298.76	301.97	454.26	376.53	315.00	288.67	477.27	412.49	378.79	316.86	331.84	361.22	351.80	292.96	264.25	387.42

Table 4: Average number of steps for successful trials, various DeepNav agents compared with random walker, A* and the agent from [1] $d_s = 970m$

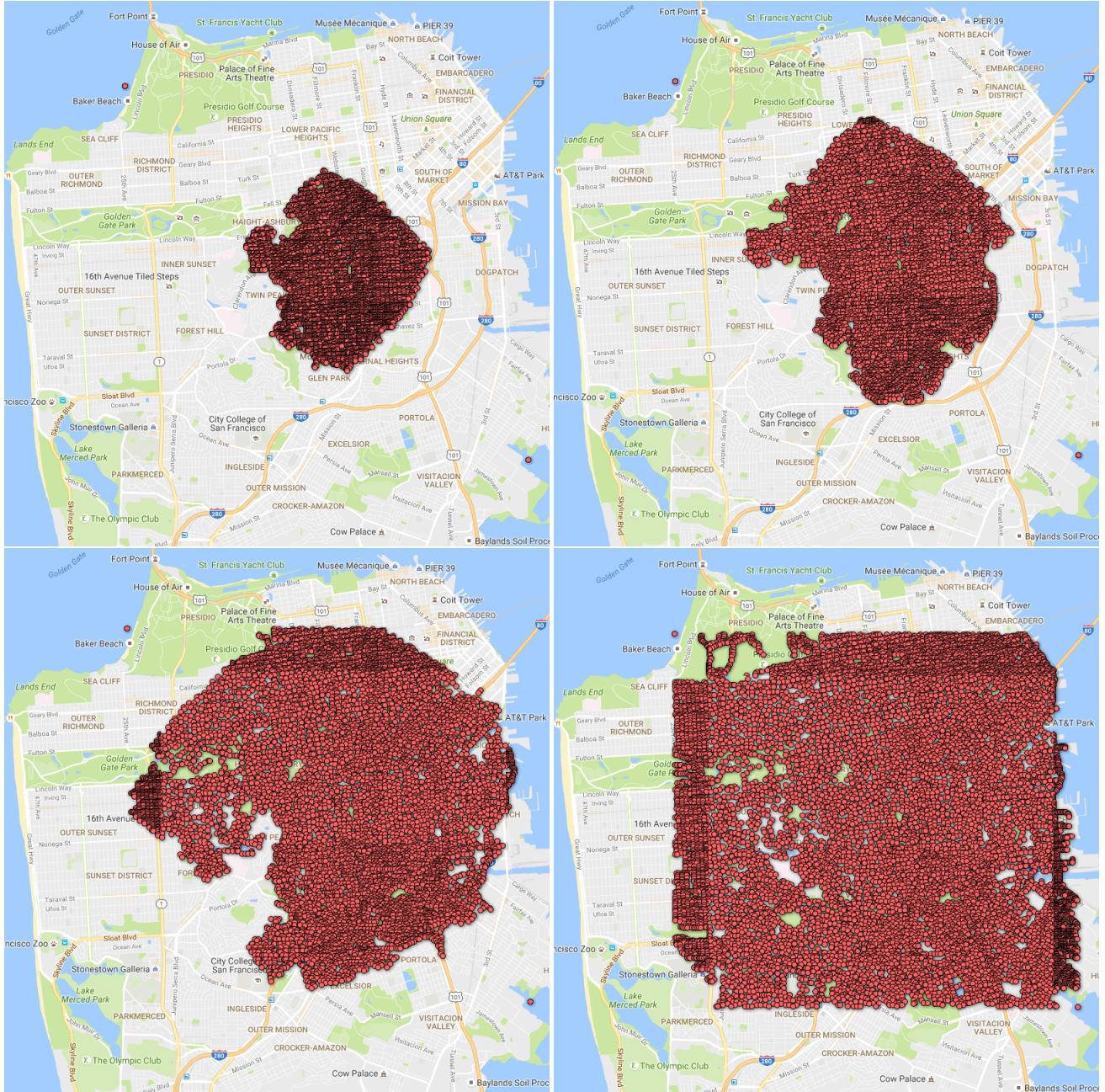


Figure 1: Progression of breadth-first enumeration for constructing the San Francisco city graph.

References

- [1] A. Khosla, B. An, J. J. Lim, and A. Torralba. Looking beyond the visible scene. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Ohio, USA, June 2014. 2