

Project One:
A* search with Tree and Graph

Cs4200 - Artificial Intelligence

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Data:

Tree:

Depth	H1 Average Time (nanoseconds)	H1 Number of Solutions	H2 Average Time (nanoseconds)	H2 Number of Solutions
4	35600	1		
5	16250	2	15600	1
6	96400	1	8000	2
7	15700	3	0	0
8	5260	10	0	0
9	21812	8	428400	1
10	28007	8	428400	1
11	18560	25	53650	4
12	42848	41	8907380	5
13	81732	67	179850	2
14	1028412	93	6983	18
15	1307215	102	507939	23
16	1124438	105	1761	34
17	5291038	26	1593205	35
18	133208700	1	27572	40
19	0	0	201443	39
20			173866	62
21			11840	40
22			1596325	36
23			140660	35
24			3362742	35
25			3651757	26
26			2647000	25

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27			2499030	13
28			7273233	12
29			13044850	6
30			20353266	3

Graph:

Depth	H1 Average Time (nanoseconds)	H1 Number of Solutions	H2 Average Time (nanoseconds)	H2 Number of Solutions
4	8400	3		
5			18100	1
6	24350	2		
7	18566	3		
8	31800	2		
9	28900	3		
10	39420	5		
11	26183	12	52200	1
12	19100	19	81250	2
13	81628	25	262300	3
14	55368	50	280600	3
15	88106	64	121557	14
16	91501	116	42658	17
17	236190	144	59852	19
18	979923	52	72112	40
19			682275	44
20			18878	51
21			9489	57
22			471698	59
23			611304	49
24			555243	51

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25			1301541	34
26			1108875	28
27			1548428	7
28			4955220	10
29			1882220	5
30			1454280	5

Observations:

Due to a lack of perfect efficiency in my code, I had to cap both the Tree and Graph searches. Under these circumstances it is clear that The second Heuristic is much more efficient than the first as it was able to find solutions to the puzzles much further down without spawning a huge amount of superfluous leaf nodes both in the Tree and Graph searches. The graph searches also appear to be quicker at deeper depths by almost exactly 50% if the average speed of depths 25-30 are compared.

Conclusions:

A* is very quick at finding paths using a graph search if provided with a good heuristic to operate off of.