

Problem	Search	Heuristic	Time	Actions	Expansions	Goal Tests	New Nodes	Plan Length
AC1	Breadth		0.040359046	20	43	56	178	6
AC1	Depth		0.010301246	20	21	22	84	20
AC1	Uniform		0.05406181	20	60	62	240	6
AC1	Greedy	Level Sum	0.548220476	20	6	8	28	6
AC1	Greedy	Max Level	0.482548331	20	6	8	24	6
AC1	Greedy	Set Level	1.065493699	20	6	8	28	6
AC1	A Star	Level Sum	0.884063358	20	28	30	122	6
AC1	A Star	Max Level	0.917987722	20	43	45	180	6
AC1	A Star	Set Level	1.59283536	20	33	35	138	6
AC2	Breadth		0.405042413	72	3343	4609	30503	9
AC2	Depth		0.611649795	72	624	625	5602	619
AC2	Uniform		0.754916704	72	5154	5156	46618	9
AC2	Greedy	Level Sum	1.90138375	72	9	11	86	9
AC2	Greedy	Max Level	2.74258503	72	27	29	249	9
AC2	Greedy	Set Level	3.673154229	72	9	11	84	9
AC2	A Star	Level Sum	26.44179109	72	357	359	3426	9
AC2	A Star	Max Level	155.7989532	72	2887	2889	26594	9
AC2	A Star	Set Level	174.2696861	72	1037	1039	9605	9
AC3	Breadth		1.023035408	88	14663	18098	129625	12
AC3	Depth		0.278185139	88	408	409	3364	392
AC3	Uniform		1.750443877	88	18510	18512	161936	12
AC3	Greedy	Level Sum	3.195184413	88	14	16	126	14
AC3	Greedy	Max Level	4.215720926	88	21	23	195	13
AC3	Greedy	Set Level	12.00712921	88	35	37	345	17
AC3	A Star	Level Sum	39.50808777	88	369	371	3403	12
AC3	A Star	Max Level	706.8791928	88	9580	9582	86312	12
AC4	Breadth		6.981187651	104	99736	114953	944130	14
AC4	Uniform		11.52661576	104	113339	113341	1066413	14
AC4	Greedy	Level Sum	5.408997724	104	17	19	165	17
AC4	Greedy	Max Level	9.865901588	104	56	58	580	17
AC4	Greedy	Set Level	58.80018	104	107	109	1164	23
AC4	A Star	Level Sum	226.4542654	104	1208	1210	12210	15
AC1	Greedy	Unmet Goals	0.005759524	20	7	9	29	6
AC2	Greedy	Unmet Goals	0.044713984	72	17	19	170	9

AC3	Greedy	Unmet Goals	0.051786257	88	25	27	230	15
AC4	Greedy	Unmet Goals	0.053579558	104	29	31	280	18
AC1	A Star	Unmet Goals	0.048153874	20	50	52	206	6
AC2	A Star	Unmet Goals	0.914400366	72	2467	2469	22522	9
AC3	A Star	Unmet Goals	2.375138284	88	7388	7390	65711	12
AC4	A Star	Unmet Goals	5.647999279	104	34330	34332	328509	14

Number of Actions vs Nodes Expanded

As the number of actions grow, greedy search expansions increase by small amounts. For A* level sum, expansions increase at larger amounts. For Uniform and Breadth first searches, there is an increase in expansions with action growth and there seems to be a jump in expansions after a certain number of actions (eg 88-104)

Number of Actions vs Search Time

- Greedy
 - Set Level - significant increase in time at more actions
 - Level Sum / Max Level - increase in time at more actions
- A*
 - All have significant increases in time at more actions
 - With level sum having least change
- Breadth / Uniform - Jump in time increase at more actions (similar to expansions)
- Depth - Time seems to increase with actions (though goal in a huge action set may be found earlier as it is left depth first search)

Optimality

- Depth first can have huge plan lengths
- Breadth / Uniform / A* show optimal plan lengths
- Greedy is not necessarily optimal but close

Which algorithm or algorithms would be most appropriate for planning in a very restricted domain (i.e., one that has only a few actions) and needs to operate in real time?

Depth first search as it has the quickest search time, however may not be optimal. For optimal algorithms use breadth search.

Which algorithm or algorithms would be most appropriate for planning in very large domains (e.g., planning delivery routes for all UPS drivers in the U.S. on a given day)

Search times and expansions for breadth / uniform search increase significantly as actions add up, these increases are not steady - so are expected to worsen for more actions

Greedy level sum seems appropriate, (given we do not require optimal length).

Which algorithm or algorithms would be most appropriate for planning problems where it is important to find only optimal plans?

For larger domains, A* level sum heuristic should be appropriate, as it provides the optimal plan in the shortest time

For small domains, breadth and uniform also provide optimal plans

