Air Cargo Planning Heuristic Analysis

# Test Results

Air cargo planning search was run for each problem set and the results are given below.

The table below gives the result for problem set 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Search Type** | **Expansions** | **Goal Tests** | **New Nodes** | **Plan Length** | **Elapsed Time (s)** |
| Breadth First Search | 43 | 56 | 180 | 6 | 0.02524 |
| Breadth First Tree Search | 1458 | 1459 | 5960 | 6 | 0.755732638 |
| Depth First Graph Search | 21 | 22 | 84 | 20 | 0.01363713 |
| Depth Limited Search | 101 | 271 | 414 | 50 | 0.07997 |
| Uniform Cost Search | 55 | 57 | 224 | 6 | 0.0276881 |
| Recursive Best First Search h\_1 | 4229 | 4230 | 17023 | 6 | 2.0938 |
| Greedy Best First Graph Search h\_1 | 7 | 9 | 28 | 6 | 0.0036352699 |
| A\* Search h\_1 | 55 | 57 | 224 | 6 | 0.029 |
| A\* Search h\_ignore\_preconditions | 41 | 43 | 170 | 6 | 0.03 |
| A\* Search h\_pg\_levelsum | 11 | 13 | 50 | 6 | 0.974229 |

Below is the result for problem set 2. Search types Breadth First Tree Search, Depth Limited Search, Recursive Best First Search with h\_1 and A\* Search with h\_pg\_levelsum took too long to complete and had to be manually terminated.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Search Type** | **Expansions** | **Goal Tests** | **New Nodes** | **Plan Length** | **Elapsed Time (s)** |
| Breadth First Search | 3343 | 4609 | 30509 | 9 | 11.435519 |
| Breadth First Tree Search | N/A | N/A | N/A | N/A | Too long |
| Depth First Graph Search | 624 | 625 | 5602 | 619 | 2.82175 |
| Depth Limited Search | N/A | N/A | N/A | N/A | Too Long |
| Uniform Cost Search | 4853 | 4855 | 44041 | 9 | 9.174799 |
| Recursive Best First Search h\_1 | N/A | N/A | N/A | N/A | Too Long |
| Greedy Best First Graph Search h\_1 | 998 | 1000 | 8982 | 15 | 1.8444889 |
| A\* Search h\_1 | 4853 | 4855 | 44041 | 9 | 9.22 |
| A\* Search h\_ignore\_preconditions | 1450 | 1452 | 13303 | 9 | 3.34161512 |
| A\* Search h\_pg\_levelsum | N/A | N/A | N/A | N/A | Too Long |

Below is the result for problem set 3. Search types Breadth First Tree Search, Depth Limited Search, Recursive Best First Search with h\_1, A\* Search with h\_1 and A\* Search with h\_pg\_levelsum took too long to complete and had to be manually terminated.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Search Type** | **Expansions** | **Goal Tests** | **New Nodes** | **Plan Length** | **Elapsed Time (s)** |
| Breadth First Search | 14663 | 18098 | 129631 | 12 | 82.59431 |
| Breadth First Tree Search | N/A | N/A | N/A | N/A | Too Long |
| Depth First Graph Search | 408 | 409 | 3364 | 392 | 1.5093 |
| Depth Limited Search | N/A | N/A | N/A | N/A | Too Long |
| Uniform Cost Search | 18223 | 18225 | 159618 | 12 | 40.8363 |
| Recursive Best First Search h\_1 | N/A | N/A | N/A | N/A | Too Long |
| Greedy Best First Graph Search h\_1 | 5578 | 5580 | 49150 | 22 | 12.41854 |
| A\* Search h\_1 | N/A | N/A | N/A | N/A | Too Long |
| A\* Search h\_ignore\_preconditions | 5040 | 5042 | 44944 | 12 | 13.745888 |
| A\* Search h\_pg\_levelsum | N/A | N/A | N/A | N/A | Too Long |

# Conclusion

For simpler case like problem 1, greedy best first graph search with h\_1 gave the most optimal solution, with fewest expansions and taking least time, followed by breadth first search. As complexity increased in problem 2 and 3 greedy best first graph search with h\_1 still gave the best result but now A\*Search with h\_ignore\_preconditions gave much better solution than breadth first search.