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| --- | --- | --- | --- | --- | --- | --- |
| **Puzzle Number** | **Algorithm** | **Heuristic** | **Sltn length** | **Search path length** | **Execution time (seconds)** | **cost** |
| 1 | UCS | N/A | 2 | 10 | 0.249 | 2 |
| 1 | GBFS | h1 | 2 | 10 | 0.218 | 2 |
| 1 | GBFS | h2 | 2 | 10 | 0.07 | 2 |
| 1 | GBFS | h3 | 2 | 10 | 0.07 | 2 |
| 1 | GBFS | h4 | 2 | 10 | 0.51 | 2 |
| 1 | A/A\* | h1 | 2 | 10 | 0.062 | 2 |
| 1 | A/A\* | h2 | 2 | 10 | 0.065 | 2 |
| 1 | A/A\* | h3 | 2 | 10 | 0.068 | 2 |
| 1 | A/A\* | h4 | 2 | 10 | 0.543 | 2 |
| 2 | UCS | N/A | 10 | 1512 | 50.057 | 10 |
| 2 | GBFS | h1 | 10 | 1736 | 58.195 | 10 |
| 2 | GBFS | h2 | 10 | 1858 | 17.767 | 10 |
| 2 | GBFS | h3 | 10 | 1305 | 11.683 | 10 |
| 2 | GBFS | h4 | 10 | 1464 | 159.336 | 10 |
| 2 | A/A\* | h1 | 10 | 1740 | 19.037 | 10 |
| 2 | A/A\* | h2 | 10 | 1093 | 9.929 | 10 |
| 2 | A/A\* | h3 | 10 | 2060 | 19.739 | 10 |
| 2 | A/A\* | h4 | 10 | 1809 | 211.769 | 10 |
| 3 | UCS | N/A | 17 | 5383 | 136.381 | 17 |
| 3 | GBFS | h1 | 17 | 5186 | 132.358 | 17 |
| 3 | GBFS | h2 | 17 | 5349 | 40.898 | 17 |
| 3 | GBFS | h3 | 17 | 5503 | 41.011 | 17 |
| 3 | GBFS | h4 | 17 | 5147 | 384.616 | 17 |
| 3 | A/A\* | h1 | 17 | 5127 | 38.456 | 17 |
| 3 | A/A\* | h2 | 17 | 5339 | 46.981 | 17 |
| 3 | A/A\* | h3 | 17 | 5118 | 40.177 | 17 |
| 3 | A/A\* | h4 | 17 | 5204 | 375.536 | 17 |
| 4 | UCS | N/A | N/A | N/A | 2.735 | N/A |
| 4 | GBFS | h1 | N/A | N/A | 3.138 | N/A |
| 4 | GBFS | h2 | N/A | N/A | 1.636 | N/A |
| 4 | GBFS | h3 | N/A | N/A | 0.889 | N/A |
| 4 | GBFS | h4 | N/A | N/A | 7.427 | N/A |
| 4 | A/A\* | h1 | N/A | N/A | 0.86 | N/A |
| 4 | A/A\* | h2 | N/A | N/A | 1.031 | N/A |
| 4 | A/A\* | h3 | N/A | N/A | 0.974 | N/A |
| 4 | A/A\* | h4 | N/A | N/A | 7.149 | N/A |
| 5 | UCS | N/A | N/A | N/A | 7.017 | N/A |
| 5 | GBFS | h1 | N/A | N/A | 7.849 | N/A |
| 5 | GBFS | h2 | N/A | N/A | 2.673 | N/A |
| 5 | GBFS | h3 | N/A | N/A | 2.364 | N/A |
| 5 | GBFS | h4 | N/A | N/A | 16.845 | N/A |
| 5 | A/A\* | h1 | N/A | N/A | 2.491 | N/A |
| 5 | A/A\* | h2 | N/A | N/A | 2.894 | N/A |
| 5 | A/A\* | h3 | N/A | N/A | 2.564 | N/A |
| 5 | A/A\* | h4 | N/A | N/A | 20.765 | N/A |
| 6 | UCS | N/A | 32 | 787 | 18.89 | 32 |
| 6 | GBFS | h1 | 32 | 761 | 18.945 | 32 |
| 6 | GBFS | h2 | 32 | 775 | 9.059 | 32 |
| 6 | GBFS | h3 | 32 | 800 | 5.992 | 32 |
| 6 | GBFS | h4 | 32 | 806 | 50.898 | 32 |
| 6 | A/A\* | h1 | 32 | 773 | 6.108 | 32 |
| 6 | A/A\* | h2 | 32 | 845 | 6.986 | 32 |
| 6 | A/A\* | h3 | 32 | 819 | 6.437 | 32 |
| 6 | A/A\* | h4 | 32 | 811 | 53.312 | 32 |

1. All algorithms came up with the same total cost but had different execution time based on the algorithm and the heuristic used for gbfs and a\_star. The execution time was significantly lower for 2nd and 3rd heuristic for the gbfs which were number of blocking vehicles and number of blocked positions multiplied by a constant(5). This makes sense as those heuristic algorithm were the better estimates and as gbfs only depends on the heuristic algorithms, it made a significant difference. For A\* algorithms, the first three heuristic had the best execution time. In general A\* had better execution time.
2. About the cost, there may be an error on our part since the cost to reach a goal is the same for all of the algorithms. Usually the A\* algorithm guarantees to find the lowest cost solution path while the GBFS doesn’t.
3. The search times for A\* algorithms with heuristics h1, h2, h3 are similar and are comparable with GBFS with heuristic h2 and h3. Usually A\* algorithms are slightly faster than GBFS. Although for some puzzles, UCS actually had a better execution time. In general an informed searched is faster.