|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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\_star the first three heuristic had the best execution time. In general a\_star had better execution time.
2. As it is shown in the spreadsheet, the second heuristic algorithm estimated better optimal path.
3. It depends on the heuristic algorithm, like for first heuristic, for some puzzles, ucs had better execution time than gbfs but in general informed search is faster.