Uniform Cost Search on Hardest Puzzle

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"C:\Pr{oram\ Files \exists ava\jdk-14.0.1\bin\java.exe"\ "-javaagent:C:\Pr{oram\ Files\JetBrains\IntelliJ\ IDEA\ Community}}
Welcome to 861218685's 8-puzzle solver.
Type "1" to use a default puzzle, or "2" to enter your own puzzle.
Enter 0 for Trivial, 1 for VeryEasy, 2 for Easy, 3 for Doable, 4 for OhBoy, and 5 for Impossible
871602543
Enter your choice of algorithm.
0) Uniform Cost Search
1) A* with the Misplaced Tile Heuristic
2) A* with the Eucledian Distance Heuristic
Expanding State
[8, 7, 1]
[6, 0, 2]
[5, 4, 3]
The best state to expand with g(n) = 1 and h(n) = 0 is...
[8, 7, 1]
[0, 6, 2]
[5, 4, 3]
The best state to expand with g(n) = 2 and h(n) = 0 is...
[8, 7, 1]
[5, 6, 2]
[0, 4, 3]
The best state to expand with g(n) = 3 and h(n) = 0 is...
[8, 7, 1]
[5, 6, 2]
[4, 0, 3]
The best state to expand with g(n) = 4 and h(n) = 0 is...
[8, 7, 1]
[5, 0, 2]
[4, 6, 3]
The best state to expand with g(n) = 5 and h(n) = 0 is...
[8, 0, 1]
[5, 7, 2]
[4, 6, 3]
The best state to expand with g(n) = 6 and h(n) = 0 is...
[8, 1, 0]
[5, 7, 2]
[4, 6, 3]
The best state to expand with g(n) = 7 and h(n) = 0 is...
[8, 1, 2]
[5, 7, 0]
[4, 6, 3]
The best state to expand with g(n) = 8 and h(n) = 0 is...
[8, 1, 2]
[5, 7, 3]
[4, 6, 0]
The best state to expand with g(n) = 9 and h(n) = 0 is...
[8, 1, 2]
[5, 7, 3]
[4, 0, 6]
```

```
The best state to expand with g(n) = 21 and h(n) = 0 is...

[1, 2, 3]

[4, 5, 0]

[7, 8, 6]

The best state to expand with g(n) = 22 and h(n) = 0 is...

[1, 2, 3]

[4, 5, 6]

[7, 8, 0]

Goal!!!

Total Moves: 22

To solve this problem the algorithm expanded a total of 92371 nodes.

The maximum number of nodes in the queue at any one time: 59800 Runtime: 237
```

Process finished with exit code 0

Had to visit 92,371 nodes with a 59,800 in memory at once

Misplaced Tile Heuristic on hardest Puzzle

```
"C:\Program Files\Java\jdk-14.0.1\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\
Welcome to 861218685's 8-puzzle solver.
Type "1" to use a default puzzle, or "2" to enter your own puzzle.
Enter 0 for Trivial, 1 for VeryEasy, 2 for Easy, 3 for Doable, 4 for OhBoy, and 5 for I
871602543
Enter your choice of algorithm.
0) Uniform Cost Search
1) A* with the Misplaced Tile Heuristic
2) A* with the Eucledian Distance Heuristic
Expanding State
[8, 7, 1]
[6, 0, 2]
[5, 4, 3]
The best state to expand with g(n) = 1 and h(n) = 9 is...
[8, 7, 1]
[0, 6, 2]
[5, 4, 3]
The best state to expand with g(n) = 2 and h(n) = 9 is...
[8, 7, 1]
[5, 6, 2]
[0, 4, 3]
The best state to expand with g(n) = 3 and h(n) = 9 is...
[8, 7, 1]
[5, 6, 2]
[4, 0, 3]
The best state to expand with g(n) = 4 and h(n) = 9 is...
[8, 7, 1]
[5, 0, 2]
[4, 6, 3]
The best state to expand with g(n) = 5 and h(n) = 9 is...
[8, 0, 1]
[5, 7, 2]
[4, 6, 3]
The best state to expand with g(n) = 6 and h(n) = 9 is...
[8, 1, 0]
[5, 7, 2]
[4, 6, 3]
The best state to expand with g(n) = 7 and h(n) = 9 is...
[8, 1, 2]
[5, 7, 0]
[4, 6, 3]
The best state to expand with g(n) = 8 and h(n) = 8 is...
[8, 1, 2]
[5, 7, 3]
[4, 6, 0]
The best state to expand with g(n) = 9 and h(n) = 9 is...
[8, 1, 2]
[5, 7, 3]
[4, 0, 6]
The best state to expand with g(n) = 10 and h(n) = 9 is...
[8, 1, 2]
[5, 0, 3]
[4, 7, 6]
```

```
The best state to expand with g(n) = 21 and h(n) = 2 is...

[1, 2, 3]

[4, 5, 0]

[7, 8, 6]

The best state to expand with g(n) = 22 and h(n) = 0 is...

[1, 2, 3]

[4, 5, 6]

[7, 8, 0]

Goal!!!

Total Moves: 22

To solve this problem the algorithm expanded a total of 6722 nodes.

The maximum number of nodes in the queue at any one time: 4192

Runtime: 37

Process finished with exit code 0
```

Had to visit 6722 nodes with at most 4192 in memory at once

Takeaways: Misplaced Tile Heuristic was almost 10x faster and used less than 1/10 the memory of the Uniform cost search while both gave the optimal solution