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CS 4200

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6 January 2022

CS 4200 Project 1 Report

My approach:

My approach is to have a basic idea on what to do and go with the flow. After receiving the input and verifying that the puzzle is solvable, I create a root node. The root node is the initial state and I add edges to the possible paths it could take. Before I create the edge we check to see if the possible path exists already. If it doesn't I create the edge, add the node to hash set of existing nodes and make a parent and child relationship between the nodes. I also add it to the frontier. After this I use the frontier to access the nodes. We keep adding edges and stop when the next node to expand is the goal state. To print the path we work our way up from the goal state to the root using the parent relationship and to do this we use a loop and stack to get it to work. Through this whole thing we counted the number of nodes and is what was used to calculate search cost.

Comparing the Two Approaches:

I was not able to test 100 cases. The 100 case test runs out of memory after 2 to 3 iterations. At least random puzzles running once work fine. I have even seen depth 26 work under 742 milliseconds for h1 (which basically feels instant). So when it is attempting to do 100 random puzzles the error shows up after 2 to 3 iterations. The best I can do is compare h1 and h2 on the same puzzle, analyzing the output.

```
Puzzle:
8 7 6
2 0 1
3 5 4
```

h1:

```
Step: 25
1 0 2
3 4 5
6 7 8
Step: 26
0 1 2
3 4 5
6 7 8
174066 This is search cost
742 is the time
```

h2:

```
Step: 25
1 0 2
3 4 5
6 7 8
Step: 26
0 1 2
3 4 5
6 7 8
5666 This is search cost
121 is the time
```

As you can see my search cost is not what it should be at this level. However the proportions of h2 being a lot lower than h1 is still there. The time you see is counted in milliseconds. The time is counted after user enters input to be accurate. You can still see this pattern throughout all the different types of tests.

Other Analysis + Findings:

```
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h1 or h2? h2
Select your choice of puzzle:
[1] From File
[2] Length of 4
[3] Length of 8
[4] Length of 20
[5] Generate Random
2
Puzzle:
1 4 0
3 5 2
6 7 8
Step: 1
1 4 2
3 5 0
6 7 8
Step: 2
1 4 2
3 0 5
6 7 8
Step: 3
1 0 2
3 4 5
6 7 8
Step: 4
0 1 2
3 4 5
6 7 8
22 This is search cost
6 is the time
```

Some weird findings from testing is that sometimes my algorithm takes 2 extra steps to find the solution, this is only on certain configurations.