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CS 4200
Project 1
7/24/23

   This goal of this project was to create an 8-puzzle creator and solver. In order to achieve this, the A* algorithm has been implemented. This algorithm involes the use of a heuristic value. For the sake of this assignment, two have been directly compared - Hamming and Manhattan. To put it shortly, Hamming is how many numbers are in the wrong position, and Manhattan is horizontal and vertical distance between start and final position. I have found that between the two heuristics, Manhattan is broadly speaking the most efficient.

   I believe that Manhattan is most efficient thanks to the fact that it's very well informed. It consideres diagonal distances rather than flat out positional distances. The output of the square puzzles in a 3x3 grid also makes it very apparent how "diagonal" distance can be crucial.

   As far as experiences gained from this project, it was definitely a way to get back into c++. Generally speaking, c++ is my favorite language. However, due to this school largely being a Java based school, I haven't had too many chances to code in c++. This was certainly going from out of the frying pan right into the fire. But I guess there's no better way to get back into coding than with incorperating an algorithm.

To compile this project:

g++ Driver.cpp Board.h AStarAlgo.h Board.cpp AStarAlgo.cpp -o 4200Project1 -std=c++11

To run the project:

./4200Project1

The Table

Depth	H1 Cost	H1 Cases	H1 Time (ms)	H2 cost	H2 Cases	H2 Time (ms)
9	60	1	9	24	1	3
10	133	1	8	18	1	4
12	99	1	4	38	1	10
13	310	2	11	47	2	9
14	564	11	10	64	11	9
15	1417	7	14	122	7	9
16	1146	13	14	120	13	10
17	2327	23	20	185	27	10
18	2919	16	22	227	17	12
19	5021	58	34	309	56	12
20	8395	54	53	397	58	14
21	12367	74	74	650	78	14
22	17019	81	99	901	83	17
23	23710	89	139	1299	83	21
24	34298	70	196	1761	63	23