ASSIGNMENT 1

Uninformed search

**BFS statistics**:   
Elapsed time (s): 1.34375

Solution found at depth: 11

Number of nodes explored: 21076

Cost of solution: 11

Estimated effective branching factor: 2.472131984902104

**DFS statistics:**

Elapsed time (s): 0.0625

Solution found at depth: 11

Number of nodes explored: 22

Cost of solution: 11

Estimated effective branching factor: 1.3244587155363412

Both give the optimal solution, however DFS is faster and more efficient.

When removing already visited states in DFS we do not get a solution. When removing already visited states in BFS, we get the following results. These are the same as with the already visited states:

Elapsed time (s): 1.40625

Solution found at depth: 11

Number of nodes explored: 21076

Cost of solution: 11

Estimated effective branching factor: 2.472131984902104

For the **IDS function**, we set the depth limit to 8, we had the following results:   
Elapsed time (s): 0.03125

Solution found at depth: 4

Number of nodes explored: 9

Cost of solution: 4

Estimated effective branching factor: 1.7320508075688772

Informed search

**h1 statistic**:

Elapsed time (s): 0.0312

Solution found at depth: 1228

Number of nodes explored: 724

Cost of solution: 1228

Estimated effective branching factor: 1.0098732035353322

**h2 statistics**:   
Elapsed time (s): 0.0625

Solution found at depth: 403

Number of nodes explored: 239

Cost of solution: 403

Estimated effective branching factor: 1.0254178140304604  
  
The h2 algorithm is performing better.

Compare different heuristics using A\*:

**A\* using h1:**

lapsed time (s): 1.296875

Solution found at depth: 82384

Number of nodes explored: 105670

Cost of solution: 82384

Estimated effective branching factor: 1.0001404263998117

**A\* using h2**:

Elapsed time (s): 0.515625

Solution found at depth: 24216

Number of nodes explored: 35576

Cost of solution: 24216

Estimated effective branching factor: 1.0004328416887576

performance measure of uninformed search methods for the puzzle:   
BFS:  
Elapsed time (s): 1.09375

Solution found at depth: 26

Number of nodes explored: 166786

Cost of solution: 26

Estimated effective branching factor: 1.1335013764587079

DFS:   
Elapsed time (s): 0.09375

Solution found at depth: 9612

Number of nodes explored: 9869

Cost of solution: 9612

Estimated effective branching factor: 1.0009545509658115

IDS:   
*time\_out*