Project #1

Description

In this project you will implement and test various heuristics for the 8puzzle game. You will learn about efficient search.

For this:

1. Copy/clone this directory. It contains a module for modelling the game (`eightpuzzle.py`) as well as a generic search module (`search.py`).
2. Make sure you have python 3 installed
3. cd to `8puzzle` folder and run the game using `python eightpuzzle.py` You should be getting something like this

```
Directory of C:\Users\Rachidi\Pacman\Pacman\8puzzle

19/06/2023  11:55    <DIR>          .
19/06/2023  11:55    <DIR>          ..
19/06/2023  11:52             9,057 eightpuzzle.py
19/06/2023  11:06             8,666 search.py
19/06/2023  11:38            26,709 util.py
               3 File(s)         44,432 bytes
               2 Dir(s)  20,932,562,944 bytes free

:\Users\Rachidi\Pacman\Pacman\8puzzle>python eightpuzzle.py
\ random puzzle:
------------
 3 |   | 8 |
------------
 5 | 2 | 1 |
------------
 4 | 6 | 7 |
------------
\* found a path of 13 moves: ['down', 'right', 'up', 'left', 'down', 'left', 'down', 'right', 'right', 'up', 'left',
ft', 'up']
\fter 1 move: down
------------
 3 | 2 | 8 |
------------
 5 |   | 1 |
------------
 4 | 6 | 7 |
------------
```

4. Review the code in `eightpuzzle.py` and `search.py`
5. Read this heuristics document

6. Make the following changes (your tasks in this project):

Task1. Implement 4 different heuristics h1, h2, h3, h4 for the 8puzzle

Implement the admissible heuristics h1, h2, h3, h4 and show that they work (i.e., solve the problem)

Task 2. Comparing heuristics

To compare the admissible heuristics mentioned earlier (h1 to h4), you need to **automatically** generate a large number of initial states for the 8-puzzle and solve each one using all 4 heuristics. You may want to write a script (`automate.py`) that reads a configuration file (`scenarios.csv`), runs the configurations and records the results (depth, expanded nodes, fringe size)

Tabulate the results and use averages to decide on which heuristic is best.

Task 3. Overall comparison between strategies

Use the best heuristic found in task 2, and this time compare it to bfs, dfs, etc.

Task4. Extra Credit: Scale the project to NxN puzzle.

Make the necessary changes to adapt the project to NxN puzzle and reriun the automatic performance test of Tasks 2 and 3.

Deliverables

Post your project on canvas as one zip file containing

1. a **pdf** document showing (i) the sections of code you added/deleted and (ii) execution traces that proves you made the changes, and the tabulated results/comparissons. **The REPORT MUST mention the name of your teammate.**
2. the search.py and eightpuzzle.py with the changes indicated by a starting comment /*=====Start Change Task i=====*/ and an ending comment /*=====End Change Task i =====*/

All members of a team are required to submit.