COSC 411 Project 2 (10 points)

Project background

In homework 1, we finished the 15-puzzle game. This project aims to generate an AI-empowered automatic 15-puzzle game using A* search. That is, you need to design a heuristic for the A* search algorithm to solve the 15-puzzle game. One similar example, 8-Puzzle Problem, can be found in our lecture note "COSC411_Module2_InformedSearch.ipynb".

Project requirements

1. Use your code for the 15-puzzle game in homework 1, generate a solvable initial configuration of the 15-puzzle.
2. Clearly define an admissible heuristic to estimate the cost/distance from each specific status to the goal status (i.e., the final configuration of the puzzle). You may refer to the four possible heuristics in the 8-Puzzle Problem or design a new heuristic.
3. Implement A* search with the heuristic defined above to automatically slide empty cell and numbered cells (to simplify the problem, you may only swap the empty cell with the immediate left/right/above/below numbered cell).
4. Demonstrate the whole solving process (from initial configuration to the final configuration) of your A*-based AI algorithm for this 15-puzzle game using the same GUI interface in your homework 1. Please keep 0.5-1 seconds interval between two neighboring moves (You may use sleep() function from the time module.).

SUBMISSION EXPECTATIONS

1. **`Report.pdf`**: A report PDF document including:
    a. Detailed explanation on what heuristic you designed/selected and why you designed/selected this heuristic?
    b. Detailed explanation on how you implemented the A* search algorithm for this 15-puzzle game.
    c. 6 screenshots for (a) initial configuration, (b) configuration after 1 move, (c) configuration after 2 moves, (d) configuration after 5 moves, (e) configuration after 10 moves, and (f) final configuration;
    d. Include references to any sources you consulted;
    e. Who you discussed with or asked help from;
2. **`FifteenAI.py`:** Your main program. Your entire Python implementation should be present within this file.

Policy

1. The students are allowed to discuss ideas with other students enrolled in the class. However, each student MUST finish the coding and report writing independently. TEAM WORK and CODE SHARE are NOT allowed.

2. If you need any help, please feel free to contact the instructor.