Program 1 assignment due Monday October 25 2021 at 11:30pm

Submit your python program or Jupyter Notebook on Moodle.

Part (A) (80%)

Write (or adapt from open-source implementation) a **python** program to implement the A^* algorithm (tree search) for the vacuum cleaning agent's problem (defined in Question 5 of Homework2). Your agent should utilize the admissible heuristic function h_1 defined in your answer to Q(5.3) in Homework 2. Run the program for the 5 by 5 grid world with top 5 squares dirty, and agent in the **left lower cornor** square (coordinate (1, 1)) as the initial state.

Print out the sequence of actions in the optimal path returned by the program. In addition, print out the f(n) values for every node n on the optimal solution path (including the final goal node).

Print out the number of nodes **expanded** by the algorithm using h_1.

Part (B) (15%)

Run your A^* algorithm for the same problem, using the alternative heuristic fundtion h_2 defined in your answer to Question (5.4) in Homework 2.

Print out the sequence of actions in the optimal path returned by the program. In addition, print out the f(n) values for every node n on the optimal solution path (including the final goal node).

Print out the number of nodes **expanded** by the algorithm using h_2.

Program documentation (5%) Please provide reasonable documentation to your program to make it easy for understanding.

If you are submitting a Jupyter nodebook, please use the first cell to include your name, and indicate any packages (other than aima-python master - which I assume by default) that would be needed to run your notebook.

If you are submitting a python program instead of a Jupyter notebook, you should either include in your submission a 'readme" file or use comments at the beginning of your python file to indicate your name and any packages needed to run your program (same as the Jupyter notebook case).

Try to name your submission with YOUR NAME (for example: Chen_Astar.ipynb or Chen_Astar.py) to make identification of your submission easier.

Use of comments is encouraged to help better understanding of your program logic.