Artificial Intelligence (CS571)

Department of CSE, IIT Patna

Assignment-1

(Read all the instructions carefully and adhere to them.)

Date: 11-Sept-2020 **Deadline**:- 17-Sept-2020

Instructions:

1. Markings will be based on the correctness and soundness of the outputs.
2. Marks will be deducted in case of plagiarism.
3. Proper indentation and appropriate comments (if necessary) are mandatory.
4. You should zip all the required files and name the zip file as:
roll_no_of_all_group_members .zip , eg. 1501cs11_1201cs03_1621cs05.zip.
5. Upload your assignment (the zip file) in the following link:

https://www.dropbox.com/request/Crim1ksa6FhNSs9SZAIm

For any queries regarding this assignment contact:

Dushyant Singh Chauhan (dushyantchauhan27@gmail.com)

Questions

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1. In a Best First Search algorithm each state (n) maintains a function

   a. $f(n) = h(n)$

   In an A* search algorithm each state (n) maintains a function

   b. $f(n) = g(n) + h(n)$

   where g(n) is the least cost form source state to state n found so far and h(n) is the estimated cost of the optimal path from state n to the goal state.

Implement Best First Search and A* search algorithm for solving the 8-puzzle problem with the following assumptions.

A. $g(n)$ = least cost from source state to current state so far.
B. Heuristics
    a. $h_1(n)$ = number of tiles displaced from their destined position.
    b. $h_2(n)$ = sum of Manhattan distance of each tile from the goal position.

2. A local search algorithm tries to find the optimal solution by exploring the states in the local region. Hill climbing is a local search technique which always looks for a better solution in its neighbourhood.
    a. Implement the Hill Climbing Search Algorithm for solving the 8-puzzle problem.
    b. Check the algorithm for the following heuristics:
        i. $h_1(n)$ = number of tiles displaced from their destined position.
        ii. $h_2(n)$ = sum of Manhattan distance of each tile from the goal position.

Instructions:

1. Input is given in a file in the following format. Read the input and store the information in a matrix. Configuration of the start state and the goal state can be anything. For example given below T1, T2, …,T8 are tile numbers and B is blank space.

Start state

T6	T7	T3
T8	T4	T2
T1	B	T5

Goal state

T1	T2	T3
T4	T5	T6
T7	T8	B

2. Output should have the following information:
    a. On success:
        i. Success Message
        ii. Start State / Goal State
        iii. Total number of states explored

iv. Total number of states to optimal path
v. Optimal Path
vi. Optimal Path Cost
vii. Time taken for execution

b. On failure:

i. Failure Message
ii. Start State / Goal State
iii. Total number of states explored before termination

3. Compare and contrast between the results of the three algorithms for the different heuristics