CS/AI 2203 – ARTIFICIAL & COMPUTATIONAL INTELLIGENCE

ASSIGNMENT-1

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

Date:15 March, 2023   **Deadline: 15 April, 2023**

Total Credit: 10

Instructions:

1. The assignment should be completed and uploaded by 1**5 April, 2023, 11:59 PM IST.**

2. Markings will be based on the correctness and soundness of the outputs. Marks will be deducted in case of plagiarism.

3. Proper indentation and appropriate comments are mandatory.

4. Make proper documentation of all results and observations with their analysis.

4. You should zip all the required files and name the zip file as:

 Roll_no.zip , eg. SE21UARI001.zip.

5. Upload your assignment (**the zip file**) in the following link:
   https://www.dropbox.com/request/xsAEptiZibfT7eknwqer

Questions

1. In a Best First Search algorithm each state (n) maintains a function
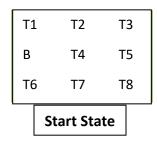
a. $f(n) = h(n)$

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 from 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. h1(n) = number of tiles displaced from their destined position.
b. h2(n) = sum of Manhattan distance of each tile from the goal position.

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.

T1	T2	T3
B	T4	T5
T6	T7	T8

Start State

T2	T3	T5
T6	T1	T8
T4	T7	B

Goal State

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 two algorithms (i.e. BFS and A*) for the two heuristics as mentioned above, and state the reasons in a document file '*Why one search technique is better than the other one?*'. While explaining, please comment on the optimality, time complexity etc.

4. Implement the Hill Climbing Search Algorithm for solving the 8-puzzle problem with h1(n) and h2(n) (mentioned above) as the objective functions. What if the search algorithm got stuck into Local optimum? Is there any way to get out of this?