Artificial Intelligence (CS571)
Assignment-2: A^* Search

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

Date: 8-8-2018

In a general search algorithm each state (n) maintains a function

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

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 a search algorithm for solving the 8-puzzle problem with following assumptions.

1. $g(n)$ = least cost from source state to current state so far.

2. Heuristics

    (a) $h_1(n) = 0$.

    (b) $h_2(n)$ = number of tiles displaced from their destined position.

    (c) $h_3(n)$ = sum of Manhattan distance of each tiles from the goal position.

    (d) $h_4(n)$ = Devise a heuristics such that $h(n) > h^*(n)$.

Instructions:

1. You should make use of two lists for the implementation. One (close list) for maintaining the already explored states and other (open list) for maintaining the states which are found but yet to be explored.

2. Input is given in a file in the following format. Read the input and store the information in a matrix. Configuration of start state and goal state can be anything. For the example given below, T1, T2, ..., T8 are the tiles number 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

3. Output should have following information:
   On success

   - Success message
   - Start state / Goal state
   - Total number of states explored.
   - Total number of states on optimal path.
   - Optimal Path
   - Optimal Cost of the path.

   On failure

   - Failure message
   - Start state / Goal state
   - Total number of states explored before termination.

4. Please make a table that should list the following for all the heuristics
   a) Total number of states explored.
   b) Total number of states on optimal path.
   c) Optimal path
   d) Optimal Cost of the path.
   e) Total time taken for execution

5. Please try to make your code as generic as possible (Preferably in C/C++/Java/Python).

6. Please collaborate with your group members.