CS561 - ARTIFICIAL INTELLIGENCE LAB

ASSIGNMENT-5: Simulated Annealing

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

Date: 4th September, 2023 **Deadline: 10th September 2023**

Total Credit: 30

Instructions:

1. The assignment should be completed and uploaded by **10 Sept. 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. You should zip all the required files and name the zip file as: **roll_no_of_all_group_members .zip , eg. 2121cs11_2211cs03_2121cs05.zip.**
5. Upload your assignment (**the zip file**) in the following link: https://www.dropbox.com/request/LZfosQPAkMjeDNnyfLur

For any queries regarding this assignment, you can contact:
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Questions

Simulated Annealing:

Start state:

5	B	8
4	2	1
7	3	6

Goal State (Fixed):

1	2	3
4	5	6
7	8	B

Please use the following details as specifications for SA implementations:

A. **Input:** Input should be taken from an input file and processed as a matrix. Other inputs are Temperature variable T, heuristic function, neighborhood generating function, probability function to decide state change, and a cooling function.

B. Objective functions to be checked:
   a. h1 (n)= Number of displaced titles.
   b. h2 (n)= Total Manhattan distance.

Questions and instructions:

1. The 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 the 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

2. Discuss the results obtained obtained in the Simulated Annealing implementations.
    a. Take multiple examples (at least 3) of the same start state and goal state combinations and compare both algorithms.
    b. Analyze the results obtained with proper justifications.
    c. Describe your results on both algorithms and *state the reasons for the difference of approach in both algorithms.*
    d. Describe your views on what algorithm should have performed better for this particular problem and does your intuition match the results?

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

3. Compare your results obtained in the Simulated Annealing implementations with hill climbing.
    a. Take multiple examples (at least 3) of the same start state and goal state combinations and compare both algorithms.
    b. Analyze the results obtained with proper justifications.
    c. Describe your results on which algorithm performed better and why?
    d. Describe your views on what algorithm should have performed better for this particular problem and does your intuition match the results?