

End Semester Examination

Course Name: Artificial Intelligence

Code: CS 571/561

Make reasonable assumptions as and whenever necessary. Carefully read the instructions circulated in the group on Nov 23, 2021.

Q1. (a). Assignment

15 points

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 neighborhood.

a. Implement Hill Climbing Search Algorithm for solving the 8-puzzle problem. Your start state can be anything and the goal state will be

{123;456;78B}, where B is blank tile.

b. **Input:** Input should be taken from an input file and processed as a matrix.

c. **Output:** All the following results should be stored in an output file (*for each of the heuristics as mentioned in d*)

- i. The success or failure message
- ii. Heuristics chosen, Start state and Goal state
- iii. (Sub)Optimal Path (on success)
- iv. Total number of states explored
- v. Total amount of time taken

d. **Heuristics to be checked:**

- i. $h_1(n)$ = Number of displaced tiles
- ii. $h_2(n)$ = Total Manhattan distance

e. **Constraints to be checked:**

- i. Check whether the heuristics are admissible
- ii. What happens if we make a new heuristics $h_3(n) = h_1(n) + h_2(n)$?
- iii. What happens if you consider the blank tile as another tile? (*for each heuristics as mentioned in d*)

- iv. What if the search algorithm got stuck into Local maximum? Is there any way to get out of this?
- v. What happens when all the neighbours of the current state have the same value? How to get rid of this situation?

Documents to submit:

- i. Codes with appropriate documentation;
- ii. Outputs as mentioned in (c) above for each of the heuristics referred in (d) above;
- iii. Detailed outputs with proper explanations for (i)-(v) of e above.
- iv. Any other explanation.

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Best of Luck