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Devanshu Surana
PC-23, 10322l0755
Panel C, Batch C1

AIES Lab Assignment 5

Aim: Implement Hill Climbing algorithm for TSP

Objective: Write C|C++|Java|Python to solve hill Climb algorithm for travelling salesman problem.

Theory:

1. Local Search Algorithm:
   1. Used for optimization problems
   2. Focuses on exploring solutions within a localized region.
   3. Continously iterating by evaluating and selecting neighbourhood solutions.
   4. Stops when no better solution can be found in local vicinity.

2. Hill Climbing Algorithm:
   1. A type of local search algorithm
   2. Begins with an initial soln.
   3. Repeatedly makes small adjustments to reach better soln.
   4. Halts when it reaches a peak where no single step improvement is possible.

Input: n x n matrix of distance for TSP.
Output: An optimal distance betn two cities.

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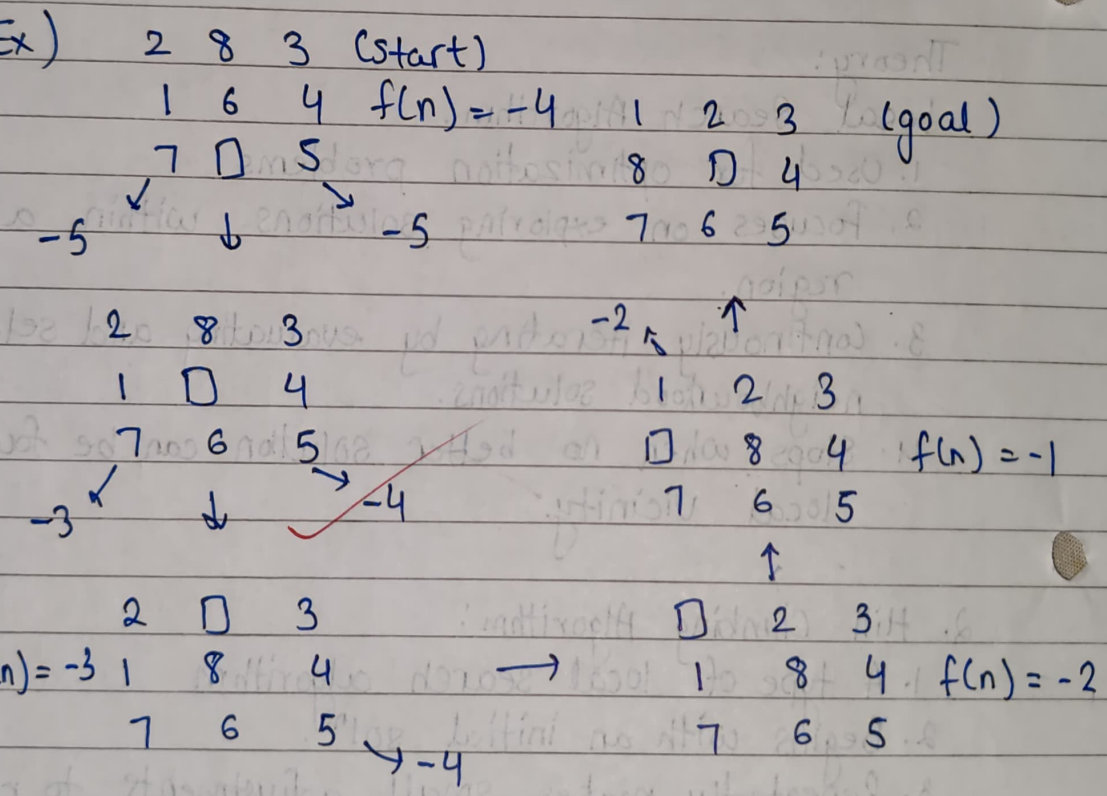
Algo: Hill Climbing Algorithm.

FAQ's

1. Explain Hill Climbing Algorithm in detail with example.

→ Hill climbing is a local search algorithm used for optimization. It starts from an initial stage (solution) and iteratively moves to neighbouring solutions with better objective values until it reaches local maximum.



2. Explain limitations of hill climbing and solutions to it.

→ 1. Local Maxima/Minima: Hill climbing can get stuck in local maximus and fail to reach global maximum. Solution include random restarts; simulated annealing and genetic algorithms to explore beyond local maxima.

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2) Plateaus and Ridges: On plateaus or step, ridges of the search space, hill climbing may progress slowly. Using stages can solve this issue. (Tabu search and simulated annealing)

3) Choice of Initial Stage: Performance can vary based on the initial solution. Using multiple initial states can solve this issue.

4) Premature Convergence: Hill climbing may converge too quickly, missing better solution. Diversification strategies and adaptive step size can mitigate this.

3. Solve N-Queen problem using local search algorithm.

→

Q - - - (start)
- Q - - f(n) = -2
- Q - -
- - Q -
↓
Q - - -
- - Q - f(n) = -2
- Q - -
- - Q -
↓
Q - - -
- - - Q f(n) = -1
- Q - Q →
- - Q -

Q - - -
- - - Q (goal)
Q - - - f(n) = 0
- - Q -

4 Queen Problem solved using Hill Climbing Algorithm.

29/11/23