Fr. Conceicao Rodrigues College of Engineering Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400050
Department of Computer Engineering
Academic Term II: 23-24

Class: B.E (Computer), Sem – VI Subject Name: Artificial Intelligence Student

Name: Sumit Sanjay Rai **Roll No: 9570**

Practical No:	**7**
Title:	Block World Problem solving by hill climbing approach
Date of Performance:	**18/03/2024**
Date of Submission:	**25/03/2024**

Rubrics for Evaluation:

Sr. No	Performance Indicator	Excellent	Good	Below Average	Marks
1	On time Completion & Submission (01)	01 (On Time)	NA	00 (Not on Time)	
2	Logic/Algorithm Complexity analysis (03)	03(Correct)	02(Partial)	01 (Tried)	
3	Coding Standards (03): Comments/indention/Naming conventions Test Cases /Output	03(All used)	02 (Partial)	01 (rarely followed)	
4	Post Lab Assignment (03)	03(done well)	2 (Partially Correct)	1(submitted)	
Total					

Signature of the Teacher:

Post Lab Questions:

1. What are the advantages and disadvantages of state space search?
2. What are the advantages and disadvantages of the Hill Climbing approach?
3. Describe variations of Hill Climbing approach
4. Solve the Block World problem by using the STRIPS method.

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PostLab:- Experiment-7

Q1. What are the advantages and disadvantages of state space search?

Ans. Advantages:

1. Completeness: Guaranteed to find a solution if one exists.
2. Optimality: Can find the best solution.
3. Flexibility: Adaptable to various problem domains.
4. Applicability: Suitable for a wide range of problems.

Disadvantages:

1. Exponential Complexity: Computationally expensive for large problems.
2. Memory Requirements: High memory usage, especially for large search spaces.
3. Heuristic Dependency: Effectiveness relies heavily on heuristic quality.
4. Optimization Challenges: finding optimal solutions can be difficult.
5. Search Space Complexity: Complexity varies, making algorithm algorithm design challenging.

Q.2. What are the advantages and disadvantages of the Hill Climbing approach?

Ans. Advantages:

1. Simplicity: Hill Climbing is easy to understand and implement, making it suitable for simple optimization problems.
2. Efficiency: It can converge quickly to a local optimum, especially in problems with smooth and continuous search spaces.
3. Memory Efficiency: Hill Climbing typically requires minimal memory, making it suitable for resource-constrained environments.
4. Low Computational Overhead: It involves minimal computational overhead, making it efficient for real-time or embedded systems.

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Disadvantages:

1. Local optima: Hill climbing is prone to getting stuck in local optima, failing to find the global optimum in non-conver search spaces.
2. No Backtracking: It lacks mechanisms for backtracking, meaning it connot escape from local optima once reached.
3. Limited Exploration: Hill climbing only explores neighboring solutions, which may lead to missing potentially better solutions that are fether away.
4. Sensitive to Initialization: Performance can vary significantly based based on the initial solution, and it may fail to converge or converge to suboptimal solutions.
5. No guarantee of optimality: There is no guarantee that Hill climbing with find the optimal solution, even if it converges.

Q.3. Describe variations of Hill climbing approach.

Ans 1. Simple Hill Climbing: Iteratively selects the first neighboring solution that improves upon the current state, but may get stuck at local optima.

2. Steepest-Ascent Hill climbing: Considers all neighboring solutions and selects the one with the highest improvement, potentially leading to better convergence but increased computational cost.

3. Random-Restart Hill climbing: Performs multiple hill climbing searches from different initial states to mitigate the risk of getting stuck in local optima.

4. Simulated Annealing: Introduces randomness to allow acceptance of worse solutions with a certain probability, facilitating escape from local optima.

5. First-choice Hill Climbing: Randomly selects neighboring solutions and accepts the first one that improves upon the current state, balancing exploration and exploitation.

6. Iterated Local Search: Combines hill climbing with perturbation

techniques to escape local optima by periodically restarting the search from different points in the solution space.

Q.4. Solve the Block World problem by using the STRIPS method.

Ans: Block World problem using the STRIPS (Stanford Research Institute problem Solver).

Initial State :	Goal state :
On (A, Table)	On (A, B)
On (B, Table)	On (B, Table)
On (C, B)	On (C, Table)

Operators :-

1. Pick up (block, source)
   Precondition : On (block, source), Clear (block).
   Effects : ¬ On (block, source), Holding (block).
2. Putdown (block, destination)
   Precondition : Holding (block)
   Effects : On (block, destination), Clear (block), ¬ Holding (block)
3. Stack (block, source, destination)
   Precondition : Holding (block), Clear (destination)
   Effects : ¬ On (block, source), On (block, destination), Clear (source), ¬ Holding (block).
4. Unstack (block, source, destination)
   Preconditions : On (block, source), Clear (block), Clear (destination)
   Effects : On (block, source), Clear (destination), Holding (block)