DATE:01.08.25

TASK 2
Hill climbing algorithm for Heuristic search

Implementation of Hill climbing algorithm for Heuristic search approach using following constraints in python.

i. Create a function generating all neighbours of a solution
ii. Create a function calculating the length of a route
iii. Create a random solution generator
iv. Create a Travelling salesman problem

Tools- Python, Online Simulator - https://graphonline.ru/en/

PROBLEM STATEMENT: **CO1** **S3**

Imagine a mountain climber trying to reach the highest point of a mountain range. The terrain is represented as a 1D array of elevations (like hill heights at different points). The climber starts at a random position and uses the hill climbing heuristic to move only to higher neighboring positions. The goal is to find the local or global maximum elevation

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TASK-2

Implementation of Hill climbing algorithm for Heuristic search approach

AIM

To implement the Hill Climbing algorithm as a Heuristic Search technique for solving optimization problems, where the objective is to find the best possible solution (maximum or minimum) based on a heuristic value.

ALGORITHM

1. Start at a random position on the terrain.
2. Check the neighboring positions (left and right).
3. Compare the elevation of the current position with neighbors.
4. Move to the neighbor with the highest elevation, if it's higher than the current one.
5. Repeat steps 2–4 until no neighbor has a higher elevation.
6. Stop – you've reached a peak (highest nearby point).

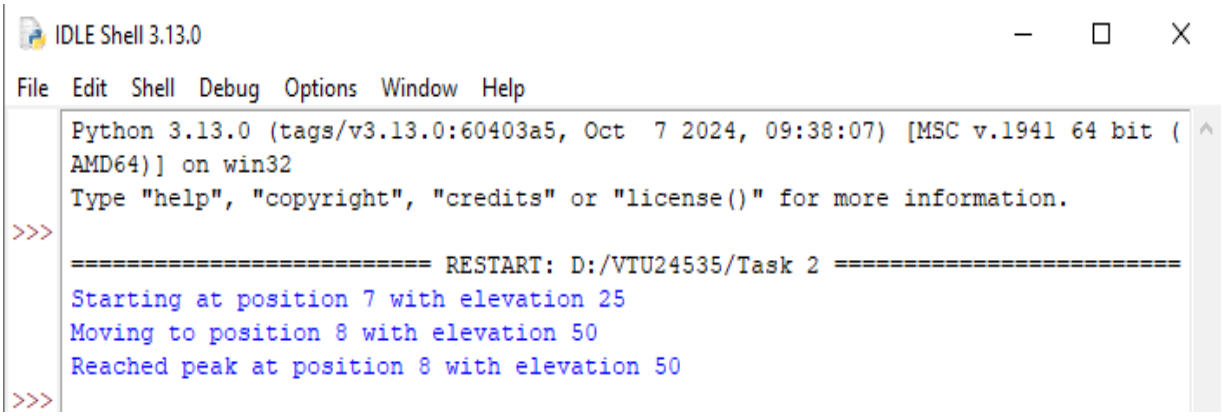
PROGRAM

Hill Climbing for Peak Finding

```
import random

# i. Function to generate neighbors (left and right positions)
def generate_neighbors(position, terrain):
    neighbors = []
    if position > 0:
        neighbors.append(position - 1)
    if position < len(terrain) - 1:
        neighbors.append(position + 1)
    return neighbors

# ii. Heuristic function: height of the terrain at a given position
def heuristic(position, terrain):
    return terrain[position]

# iii. Random starting point
def get_random_position(terrain):
    return random.randint(0, len(terrain) - 1)

# Hill Climbing Algorithm
def hill_climbing(terrain):
    current_position = get_random_position(terrain)
    current_value = heuristic(current_position, terrain)

    print(f"Starting at position {current_position} with elevation {current_value}")

    while True:
        neighbors = generate_neighbors(current_position, terrain)
        best_neighbor = current_position
        best_value = current_value

        for neighbor in neighbors:
```

```
            neighbor_value = heuristic(neighbor, terrain)
            if neighbor_value > best_value:
                best_value = neighbor_value
                best_neighbor = neighbor

        if best_value == current_value:
            break  # No better neighbor found — local maximum
        else:
            current_position = best_neighbor
            current_value = best_value
            print(f"Moving to position {current_position} with elevation {current_value}")

    print(f"Reached peak at position {current_position} with elevation {current_value}")

# Example terrain (elevations at different points)
terrain = [10, 20, 15, 25, 30, 40, 35, 25, 50, 45]

# Run the algorithm
hill_climbing(terrain)
```

OUTPUT



RESULT

Thus the implementation of Hill Climbing algorithm as a Heuristic Search technique for solving optimization problems problem using python was successfully executed and output was verified.