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

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

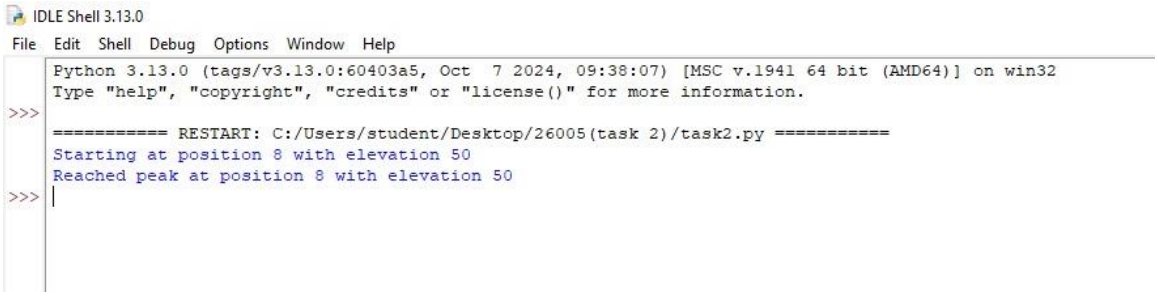
PROGRAM

Hill Climbing for Peak Finding

```
import random

def generate_neighbors(position, terrain):
    neighbors = []
    if position > 0:
        neighbors.append(position - 1)
    if position < len(terrain) - 1:
        neighbors.append(position + 1)
    return neighbors

def heuristic(position, terrain):
    return terrain[position]

def get_random_position(terrain):
    return random.randint(0, len(terrain) - 1)

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
        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}")

terrain = [10, 20, 15, 25, 30, 40, 35, 25, 50, 45]

hill_climbing(terrain)
```

OUTPUT


IDLE Shell 3.13.0
File Edit Shell Debug Options Window Help
Python 3.13.0 (tags/v3.13.0:60403a5, Oct 7 2024, 09:38:07) [MSC v.1941 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/student/Desktop/26005(task 2)/task2.py ==========
Starting at position 8 with elevation 50
Reached peak at position 8 with elevation 50
>>>

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.