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**HILL CLIMBING**

**PROBLEM STATEMENT**: Traveling Salesman Problem using Hill Climbing

**HILL CLIMBING:**

* Hill Climbing is a heuristic search used for mathematical optimization problems in the field of Artificial Intelligence.  
  Given a large set of inputs and a good heuristic function, it tries to find a sufficiently good solution to the problem.
* This solution may not be the global optimal maximum.
* Hill climbing is a variant of generate and test algorithm.
* It uses the greedy approach.
* There are various types of hill climbing such as simple hill climbing, steepest ascent hill climbing, stochastic hill climbing, random restart hill climbing.

**TRAVELING SALESMAN PROBLEM :**

* The traveling salesman problem is famous because it is difficult to give an optimal solution in a reasonable time as the number of cities in the problem increases. Here distance data for 13 cities is considered. The problem is to find the shortest route from a starting location and back to the starting location after visiting all the other cities. This problem has 479001600 ((13-1)!) permutations and if we added one more city it would have 6227020800 ((14-1)!) permutations.
* It would take to long to test all permutations, we use hill-climbing to find a satisfactory solution.
* The initial solution can be random, random with distance weights or a guessed best solution based on the shortest distance between cities.

**ALGORITHM:**

STEP1:Start from a random state (random order of cities)

STEP 2: Generate all successors (all orderings obtained with switching any two ad-jacent cities)

STEP 3: Select successor with lowest total cost

STEP 4:Go to step 2

**TIME AND SPACE COMPLEXITY:**

Time complexity : For Traveling Salesman Problem worst case time complexity is O(n^2\*2^n) where n is the number of nodes.

Space complexity : O(2^n)