

DAA Assignment 4

* Aim: Write a program to solve Travelling Salesman Problem and to print the path using dynamic programming.

* Theory:

- Generally a salesman has to collect sales order & products from office. Then he can start tour for selling those products in different cities and has to return to office and also from shortest possible routes.
- The Travelling Salesman Problem (TSP) is a classic optimization problem that involves ordering of given inputs to get an optimal solution.
- Such permutation problems evaluate $n!$ permutations if given inputs are n . However subset selection problems with n inputs evaluate 2^n subsets by making decision either for inclusion of input or its exclusion from solution set.
- Complexity Analysis
 - i) The dynamic programming approach solves TSP by solving overlapping sub problems. For TSP instance with n cities there are $n^2 2^n$ subproblems.
 - ii) Each subproblem takes linear time ($O(n)$) to solve.

iii) Hence for n cities total time is $O(n^2 2^n)$

* Input

$c[l:n, l:n]$ is the adjacency matrix of a connected graph $G = (V, E)$ where V is the set of nodes representing the cities & E is set of edges representing the paths connecting to the cities.

$$n = |V|$$

$c[i, j] = 0$, $c[i, j] = \infty$ if edge $\langle i, j \rangle \notin E$ and $c[i, j] = \text{positive real number}$ if $\langle i, j \rangle \in E$. V_0 is starting node (city)

* Output : A minimum cost of tour that visits all nodes (cities) in a graph only once excluding the first city which is visited.

* Conclusion : Thus we solved TSP using dynamic programming.