Jaypee University Of Information Technology

Department of Computer Science and Engineering

Project Report

TITLE - DeTour

Course Code: 18B17CI472
Course Name: DESIGN and ANALYSIS of ALGORITHMS LAB

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INTRODUCTION

Our project title is **DETOUR.** This project is based on a well-known project of Algorithms. It is generally a Travelling Salesman Problem (TSP), a famous optimization problem in computer science. The problem involves finding the shortest possible route that a salesman can take to visit a given set of cities and return to his starting point. However, here we will be planning your perfect trip in minimum distance.

PROBLEM STATEMENT

Given a list of cities and its coordinates. Generate the distances between them. Users have to choose cities to which he/she want to travel to. “**What is the shortest possible route that visits each city exactly once and returns to the starting city?**” is a problem statement we will be solving during this project.

FEATURES

- Finds shortest path
- Calculates minimum distance
- Less time complexity
- Interactive Portal
- Less response time
- Manageable

TECHNOLOGY STACK

- We are using **C++ language** for the implementation of this project. This makes it much easier to manipulate code, unlike procedural or structured programming which requires a series of computational steps to be carried out.

- Use of **2-D Matrix**. It is used to store distance between cities. Here, the lower bound of the Matrix will be null, as in this project we are discussing the routes with only one means of transport i.e. a car.

- Implementation using **Dynamic Programming**. This algorithm takes advantage of the fact that the optimal solution to a subproblem of TSP can be used to solve the next subproblem. The algorithm maintains a table of solutions to subproblems, with each entry representing the shortest path from the starting city to a specific city that includes a subset of the remaining cities.

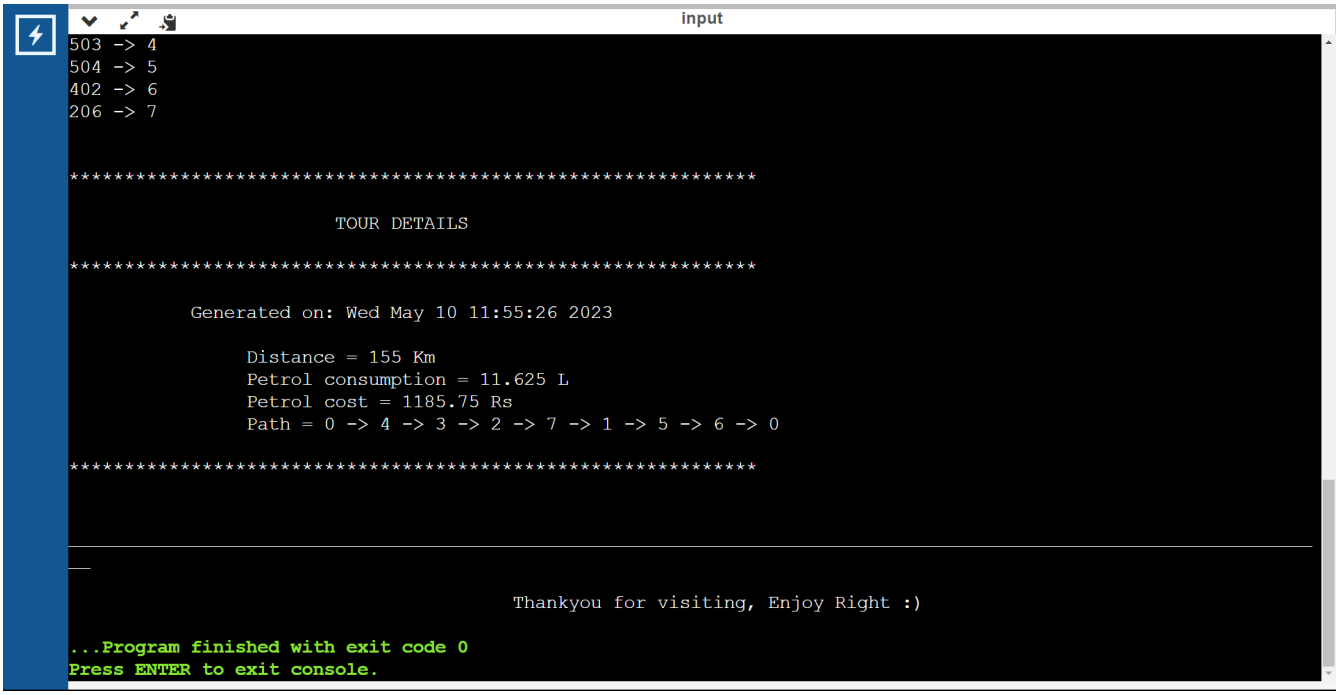
- Use of **File Handling**. It is used here to store the data of coordinates and distance of cities in India.

PSEUDO CODE

```
int tsp(vector<vector<int>>& graph, int start, int mask, vector<vector<int>>& dp, vector<vector<int>>& next)  do
    int n = graph.size();
    if (mask == (1 << n) - 1) then
        return graph[start][0];
    if (dp[start][mask] != -1)  then
        return dp[start][mask];
    int ans = INF;
    int idx = -1;
    for (int i = 0; i < n; i++)  do
        if ((mask & (1 << i)) == 0) the
            int newMask = mask | (1 << i); and
             int newAns = graph[start][i] + tsp(graph, i, newMask, dp, next);
            if (newAns < ans) then
                ans = newAns;
                idx = i;

    next[start][mask] = idx;
    return dp[start][mask] = ans;
```

OUTPUT


input
503 -> 4
504 -> 5
402 -> 6
206 -> 7
TOUR DETAILS
Generated on: Wed May 10 11:55:26 2023
Distance = 155 Km
Petrol consumption = 11.625 L
Petrol cost = 1185.75 Rs
Path = 0 -> 4 -> 3 -> 2 -> 7 -> 1 -> 5 -> 6 -> 0
Thankyou for visiting, Enjoy Right :)
...Program finished with exit code 0
Press ENTER to exit console.

CONCLUSION

Travelling salesman problem is a NP hard problem. Here, we have used other technologies like file handling, random modules etc to implement it right. We conclude our project by thanking our mentor Dr. Subham Goel sir who guided us throughout the way.

LEARNING OUTCOME

In this project, we learn about algorithms and its implementation. A general knowledge about Dynamic programming. Also we learned to manage our work to grow our project in the right direction.