Tour Optimization

Background

Travelling experience has great impact on the tourist satisfaction, and therefore, tourists pay more attention to the experience utility of the tour. The present problem is how to plan the tour route to maximize tourism experience utility considering tourists' preference of attraction, time, and cost budgets. The utility function for the tourism experience, consisting of utilities of tourism activities and travel, was proposed. An optimization model for tour route planning was established with the objective function of the tourism experience utility. Then, the computational method to obtain the optimal solution was given, and the feasibility of the method was validated by an example of a tourism transportation network value of time.

Methodology

The methodology used takes a hint from the **TRAVELLING SALESMAN PROBLEM** for route optimisation and using dynamic programming to ensure a faster response rate for the model.

Dynamic optimization is a method for solving a complex problem by breaking it down into a collection of simpler sub-problems, solving each of those sub-problems just once, and storing their solutions. Dynamic programming problems can be solved in 'stages'.

Objectives

Route optimization: Optimisation of the route for a tourist to ensure that the shortest path is proposed before the journey to facilitate smoothened travelling experience

$$Z_1 = \sum_{i,j=1}^{i,j=n} C_{i,j} X_{i,j}$$

Number of vehicles optimization: Inventory Management to ensure the number of vehicle (Pre-owned and Rented) are in sync with the demands

$$Z_2 = l * c + m * d$$

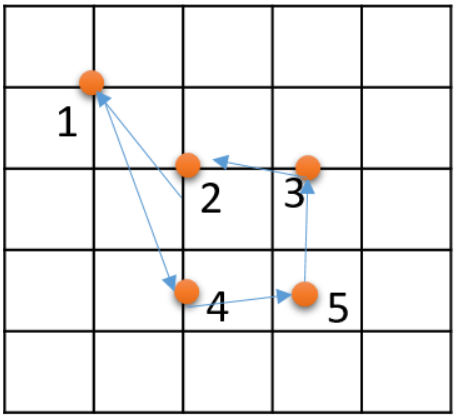
Cost optimization: Vehicle Management to ensure the distribution of vehicles to different routes based on the capacity and budget requirements of the travellers

$$Z_3 = \sum_{1}^{n} (p_i c_i * q_i d_i)$$

Constraints

1. Ensure that there is no sub-routing
2. Only one vehicle leaves a particular location
3. Demand doesn't exceed the capacity of the vehicle
4. one location is visited by a vehicle only once.

Optimal Solution



The optimal route comes out to be:

1 → 4 → 5 → 3 → 2 → 1

Minimum investment by the company to buy vehicles and satisfy the daily demand is = **$ 220.0**

Number of vehicles x = 5.0 (c-type)

Number of vehicles y = 1.0 (d-type)

So, there were 5 groups of 2,7,23,19,13 for locations 1,2,3,4,5 respectively:

1st group has been taken to their location by d-type vehicle

2nd group has been taken by d- type vehicle

3rd group has been taken by both c-type and d –type (14 by c type & 9 by d type)

4th group has again been taken by both types (10 by c-type & 9 by d-type)

5th group again by both types (4 by c-type & 9 by d-type)

Minimum Cost to Company = $ 656.0

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