The Optimization of Tourism Design Problem Based on Low Carbon and Environment Protection

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Abstract. The design of low carbon tourism could reduce the cost of tourism and improve the comfort of tourism, and also could achieve the purpose of environmental protection. In view of the optimization of travel routes problems concerning 10 most popular domestic attractions in 2015, the case of low carbon tourism of the least travel costs was designed. Travel cost is mainly composed of transportation, tickets and accommodation costs, among which the transportation cost is the main part. Under the assumption that the shorter is the linear distance, the less is the transportation cost, a 0-1 programming mathematical model was established, and was resolved through the lingo software. According to the results, the optimized results are detected and the proportion of gas pollution emission is reduced. combined with the actual traffic conditions, the recommended prior travel plan to get around ten sights are 14 days, the total cost is 11108.5 yuan.

Introduction

Tourism is a model of economic development, and also a popular way of entertainment[1]. With the vigorous development of the tourism industry, the environmental problems brought by tourism have become more and more concerned by people. Tourist travel is generally concentrated in the high season, coupled with the scenic service consciousness does not reach the designated position, infrastructure construction lags, lacking of unified planning for tour route development, traffic congestion, garbage everywhere, environmental deterioration and other phenomenon often occur, it undoubtedly affect further healthy development of tourism industry, directly or indirectly affect the economic benefits, environmental benefits and social benefits.

Reasonable arrangement for travel route, not only can tourist enjoy personalized services, but also can effectively alleviate congestion phenomenon of scenic spots, realize green travel, improve the environment quality of scenic spots, to promote sustainable development of tourism[2-3]. In view of the 0-1 integer programming with the extensive application of logistics transportation[4], agricultural science[5], human resource allocation in fields are widely used, this paper analyzes the case of a travel route optimization, establishes the mathematical model of 0-1 programming, and using lingo software to solve the model, the best travel scheme under different situations is obtained, and compares the "best plan" and the "average" energy saving in saving money, reducing emissions effect. In this paper, the optimization about the travel agency or tourists travel route has a certain guiding significance.

Question Description

In 2015,10 of the most domestic tourist destination are Badaling(2), Huangshan(3), Jiuzhaigou(4), Potala Palace(5), Lijiang(6), Guilin(7), Sanya(8), Gulangyu(9), West Lake(10). A youth volunteer social practice research group from Shijiazhuang city intended to do site investigation above the 10 scenic spots during the holiday, and finally returned to Shijiazhuang, requirement of various attractions are expected to stay at 4h,8h,4h,8h,4h,8h,8h,8h,8h and 4h.
Model Assumptions and Symbolic Description

Model Assumptions

1) assume that all sorts of way to travel and scenic spots in normal operation, without human force majeure factors such as weather conditions on the influence of the process of tourism.
2) assume that there is no rode maintenance in the process of tourism, traffic control and other human factor influence on travel.
3) the city’s public transports costs are equal, are 10 yuan/day.
4) the cost of each scenic spot only consider attractions tickets, don’t consider buying souvenirs or to participate in the activities for other project.
5) accommodation is preferred when the cost of accommodation for 100 yuan per night hotel, meals subsidies 100 yuan / day.

Symbolic Description

M: tourism total cost, m1: the total transportation costs; m2: the total cost of tickets; m3: accommodation, indoor transportation fee; Cj: the ith scenic spot ticket cost; w: the total travel distance of each route; xij:=1, it is said the i resort to j, or =0 (0-1 variables); rij: that the distance between i attraction and j; tij: that the time needed from i attraction to j.

Table 1. The distances of each scenic spots.

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Note: the data in the table from Baidu map distance function, obtain the straight line distance between two points.

Problem Analysis

The 10 spots are distributed all over the country. It is very necessary to improve the quality of tourism by reasonable arrangement the plan of trip. Problem is that the cost of traveling at least as a goal, the most important part is the transportation cost. Considering the amount of transportation cost by plane than by train or bus and self-driving mode of transportation cost, then consider the safety and comfort of train is higher than by coach, problem that the preferred way to travel for the train, and preference containing high iron or train, if there is no direct high-speed rail between two points or train, consider by air, or combined with the actual situation, take the plane to transfer to the train. Get straight away any two spots through the Baidu map distance function (see Table 1), under the assumption that the shorter is the linear distance, the less is the transportation cost, a 0-1 programming mathematical model was established, and was resolved through the lingo software. under the assumption that the shorter is the linear distance, the less is the transportation cost, a 0-1 programming mathematical model was established, and was resolved through the lingo software.
On the basis of the results, according to tourism destination or the actual traffic situation, reasonable choice of the train (including EMU, high-speed rail) or airplane travel, and in order to further reduce the cost, can choose to rest on the train, which can be saved in the local accommodation. Finally, transportation costs, plus the cost of accommodation and attractions the cost of tickets and transportation cost, that obtain the minimum total cost of travel.

The Establishment and Solution of the Model

If don't consider the shopping or entertainment costs in scenic spots, the total cost of travel M is mainly composed of m1, attractions tickets cost m2, accommodation and catering and indoor transportation m3, etc.

\[ M = m1 + m2 + m3. \]

Among, \( m1 \) is proportional to the \( w; m2 = \sum_{i=1}^{10} c_i; m3 = \text{daily board and lodging fee} \times \text{days} + \text{indoor transportation fee per day} \times \text{days} \)

Generally speaking, transportation costs account for the main part of the cost of travel. If the tourist attractions of the ticket cost is seen as the same, then the total cost of transportation will become the main objective of optimization, and get the objective function.

\[ \min w = \sum_{i=1}^{11} \sum_{j=1}^{11} r_{ij} \times x_{ij} \]

The constraint condition for all 10 scenic spots is

\[ \sum_{i=1}^{11} \sum_{j=1}^{11} r_{ij} = 11. \]

We put all the attractions into a circle, each of the spots is a point on the circle. Then, for each of the spots, at the most only one side enter, the same can only allow one side out at the most. And as long as there is a side to have one side out, so

\[ \sum_{i=1}^{11} r_{ij} = 1, \sum_{j=1}^{11} r_{ij} = 1, i, J = 1, 2, 3, \ldots, 11. \]

Likewise, when \( i, j \) is greater than or equal to 2, according to the question impossible \( r_{ji} = r_{ij} = 1 \), it is impossible that tourists travel back and forth between the two, because it obviously does not satisfy the principle of scenic spots as much as possible. So we can get

\[ r_{ij} \times r_{ij} = 0, i, j = 2, 3, \ldots, 11. \]

The mathematical model of this problem is obtained

\[ \min m = \sum_{i=1}^{11} \sum_{j=1}^{11} r_{ij} \times x_{ij} \text{ s.t.} \]

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\sum_{i=1}^{11} \sum_{j=1}^{11} r_{ij} &= 11 \\
\sum_{i=1}^{11} r_{ij} = 1, \sum_{j=1}^{11} r_{ij} = 1, i, J = 1, 2, 3, \ldots, 11 \\
r_{ij} \times r_{ij} &= 0, i, j = 2, 3, \ldots, 11
\end{align*}
\]
By lingo software calculation results, the shortest distance is 9014km, which optimal route is shijiazhuang→Badaling→Westlake→Huangshan→Gulangyu→Guilin→Sanya→Lijiang→Potala place→Jiuzhaigou→zhangjiajie→shijiazhuang. The longest path length is 12812km, the average path is 10931km, it can be saved 17% if using this the result of optimization. It is inferred that the optimized travel can reduce the gas emission ratio by 8.5%.

According to the problem calculation results, combined with 12306 nets or trains to which network data, can get the actual travel schedule,. Actual total is 14 days, the actual total cost (including transportation, tickets, accommodation, meals) is 11108.5 yuan. Among them, the indoor transportation in 10 yuan, food allowance of 100 yuan/day, a total of 14 days = 1540 yuan

**Conclusion**

In view of the optimization of travel routes problems concerning 10 most popular domestic tourist attractions in 2015, the optimization problem of a class travel routes is designed. Through the consult relevant map software, find out the distance or travel time between attractions, design the shortest path optimization problem situation, namely from Shijiazhuang, into a scenic spot, and through all of the other attractions in turn again, and then return to the starting point of the shortest route. The design model of 0-1 programming problem by lingo optimization software to solve the model, and gives the best table schedule. Although the real problem is simplified, can obtain the approximate optimal solution, but in reality the global optimal solution need to consider the actual traffic conditions, weather conditions and other factors affecting the scenic area, in order to make the results has more practical significance.

**Acknowledgment**

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**References**


