Tourist guide route planning based on ant colony algorithm

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Keywords: Tourist guide, Route Planning, Ant Colony Algorithm

Abstract: Tourism has become a fashionable leisure way. Choosing the right travel route can not only save traffic time, improve traffic quality, but also save transportation cost. Dynamic planning of routes can achieve load balancing of tourist attractions and guide tourists to the current small tourist attractions, which can make more reasonable and full use of tourism resources. The purpose of this paper is to solve the routing planning problem based on ant colony algorithm. Experimental results show that ant colony algorithm has high reliability and operability in optimal path solution and dynamic path planning.

1. Introduction

Today, tourism has become a fashion leisure way, the appropriate tourist routes chosen not only can save traffic time, improve traffic quality, but also can save transportation costs. Therefore, how to find such a best line is particularly important[1]. The most beautiful village project in Hunan Pingjiang Maitian closely follows the national policy of building beautiful and new rural areas[2]. It also integrates the rural tourism resources and puts the issue of "agriculture, rural areas and farmers" on the wings of tourism development, which is realizing a new way of rural development. The Institute believes that there are thousands of years of farming civilization on the Chinese fertile land[3]. The development of tourism industry in the context of global tourism, rural tourism has unique advantages. The future development of rural tourism also needs more intelligent service agencies such as Guangzhou Wisdom Company, which will insert wisdom wings for the development of rural tourism in a new era[4].

According to the map of Google, this paper locates the latitude and longitude of 51 tourist attractions of Zhangjiajie scenic spot. Through computer processing, we can take the national forest park as the origin and the east and north as the X and Y-axes, the Cartesian coordinate system of Zhangjiajie scenic spot is established[5,6]. Assuming that the cable car station is built on each of the spots, the minimum spanning tree algorithm in graph theory is used to find the optimal route for laying the cableway and the minimum cost S = 4,546,550,000 yuan (Vegni and Loscri, 2015; Chen et al., 2014). Observing the proximity of many attractions, visitors to these attractions can be picked up by a cable car station, which is the focal point for these attractions. In this paper, the wisdom of rural tourism scenic spots laying ropeway abstract graph for the shortest path model, using the minimum spanning tree for expression[7,8].

2. The principle of rural tourism

This paper takes Zhangjiajie scenic spot as an example to establish the corresponding mathematical model and solve the problems mentioned. According to the information found on the Internet, you can get Zhangjiajie scenic spots of the warp, latitude. We use computer knowledge, Appendix table 1 data processing, you can get the Zhangjiajie National Forest Park as the origin of the plane coordinate system (Figure 1).

  DOI: 10.25236/dpaic.2018.048

Table 1. Zhangjiajie Attractions to the National Forest Park as the origin

NO.	Tourist spots	X axis	Y axis	NO.	Tourist spots	X axis	Y axis
1	Zhangjiajie Nine days Hole	-18	115	27	The Treasure box of the heavenly Book of Zhangjiajie	-9	27
2	Zhangjiajie Emperor Mountain Town	3	114	28	Zhangjiajie South Tianmen	-8	28
3	Zhangjiajie General Rock	11	95	29	Zhangjiajie Split Save mother	-2	26
4	The peak of the emperor of Zhangjiajie	21	86	30	Zhangjiajie Ding Poseidon Needle	-1	28
5	Zhangjiajie Longquan Waterfall	-9	75	31	Zhangjiajie overpass	12	28
6	Zhangjiajie Mandarin Duck Waterfall	21	68	32	Zhangjiajie Mountain and Mountain	5	25
7	Zhangjiajie Aerial Garden	27	64	33	Zhangjiajie Protection Whip Condor	3	22
8	Zhangjiajie Sightseeing Elevator	24	55	34	Zhangjiajie Golden Whip Rock	2	21
9	Zhangjiajie Sky Mansion	-19	63	35	Zhangjiajie Summen Rock	-2	16
10	Zhangjiajie days suspended Bailian	0	57	36	Zhangjiajie Couple Rock	-9	12
11	Zhangjiajie Air Corridor	-16	50	37	Zhangjiajie National Forest Park	0	0
12	Zhangjiajie Bridge	-1	50	38	Zhang Liang Tomb of Zhangjiajie	29	47
13	Zhangjiajie Soul Station	-2	47	39	Zhangjiajie Water around four doors	35	45
14	Zhangjiajie Five female Apprentice	-2	44	40	Zhangjiajie God Soldier Party	31	53
15	Zhangjiajie Garden	9	45	41	Zhangjiajie Old House	31	62
16	Zhangjiajie Huanhuan Tree	16	41	42	The old man of Zhangjiajie	42	68
17	Zhangjiajie Jumping Fish Pond	18	40	43	Zhangjiajie Immortal Bridge	30	77
18	Zhangjiajie Purple Pond	9	40	44	The Lions of Zhangjiajie look back	56	71
19	The pier of the Zhangjiajie overpass	-11	40	45	Zhangjiajie Rooftop 1	46	89
20	Zhangjiajie Black Fir Brain	-9	38	46	Zhangjiajie Rooftop 2	53	83
21	Zhangjiajie Trinidad Meet	11	39	47	The Fairy flowers in Zhangjiajie	64	88
22	Zhangjiajie Bougainvillea Xian ge	-24	28	48	Zhangjiajie Imperial PK.	55	90
23	Zhangjiajie Huangshi	-5	34	49	Zhangjiajie West Sea	50	86
24	Zhangjiajie Mandarin Duck Spring	-16	26	50	Zhangjiajie Helong Park	56	92
25	Zhangjiajie Double Turtle Exploration Creek	57	36	51	Zhangjiajie Eagle Nest Village	109	22
26	Zhangjiajie South Day Column	-6	29	49	Zhangjiajie Rooftop 3	55	85

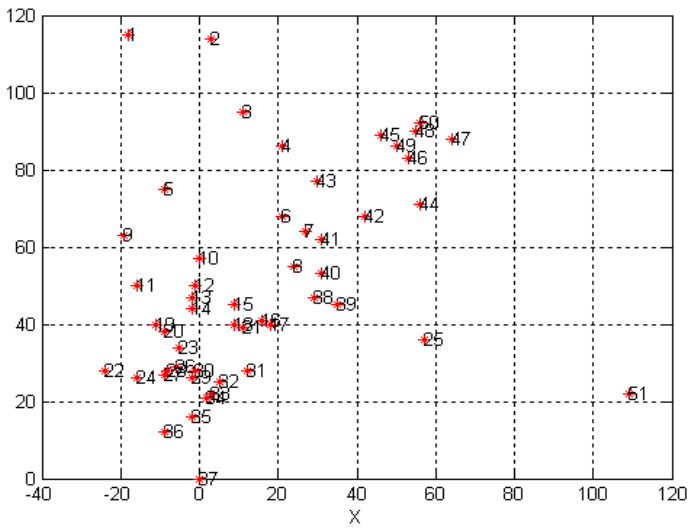

Figure 1. The National Forest Park as the origin

3. Basic steps of ant colony algorithm

Step 1: make each of the vertices 1, 2..., N. Determine the matrix D_0 where the (I, j) elements are equal to the length of the shortest line segment from vertex I to vertex j (if the shortest line segment is available). If there is no such line, then, $d_{ij}^0 = \infty$, for i, $d_{ii}^0 = 0$.

Step 2: apply the following recursive formula to the element from D_{m-1} to D_m that m = 1, 2,.., N, which is determined by elements of the element $\mathrm{d}_{\mathrm{ij}}^{\mathrm{m}} = \min\left\{d_m^{m-1} + d_{mj}^{m-1}, d_{ij}^{m-1}\right\}$. Whenever an element has identified, write down the path it represents. When the algorithm terminates, the element (i, j) of the matrix D_n represents the shortest path length from vertex I to vertex j.

Note: for all i and m, $\mathrm{d}_{\mathrm{ii}}^{\mathrm{m}} = 0$ the diagonal elements of the matrix D_1, D_2, ..., D_n are not required to be computed, $d_{\mathrm{im}}^{m-1} = d_{im}^m$ and $d_{\mathrm{mi}}^{m-1} = d_{mi}^m$, for all i = 1, 2,..., n. This is because there is no negative loop, so the vertex m is not the middle point in any of the most short-circuit at vertex m. Therefore, the calculation of matrix D_m in the row m or column m needs to be calculated. In each matrix D_m, not in the diagonal, not in the m row and the m column (N - 1) (N - 2), the elements need to be calculated.

From the above information, together with Matlab, the 51 scenic spot coordinates are processed.

Step 1: take the coordinates of 51 scenic spots and use Matlab to realize the distance between any two points.

Step 2: according to the weight between 51 spots, the cable car ropeway is found by using Floyd algorithm to construct the optimal path, d = 454.6550 mm, the distance required minimum cost as the actual distance d = 45465.50 m S = 4.450506 billion Yuan. In this step, 51 aerial cable car station coordinates were processed, and the smallest supporting tree with the power of Figure 2 has obtained. Therefore, we can get a road map for laying cable cars

Step 3: we can draw the road map.

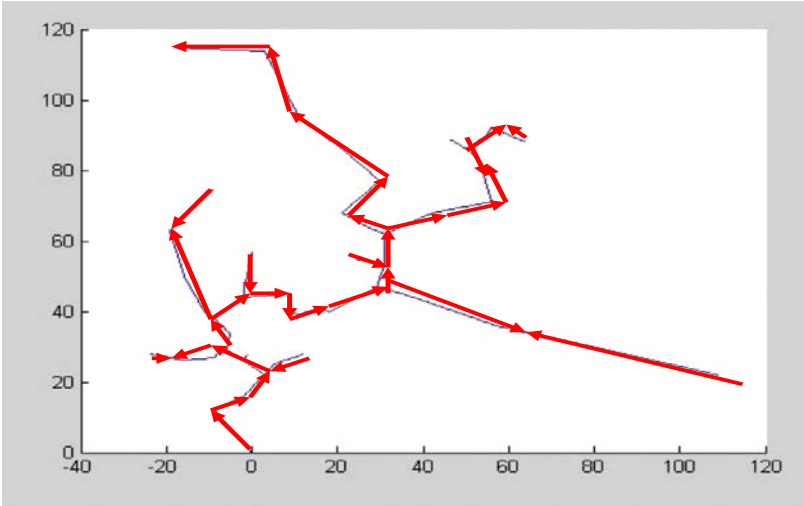

Figure 2. 50 spots the minimum spanning tree of the general trend

4. Conclusions

The innovation of this paper lies in carrying out a new clustering process on the spots with high density. The general clustering analysis combines two nearest points of all the known points into a new point, repeatedly searching and clustering until there is only one stop of the classes. However, the clustering method in this paper has a more restrictive condition than the general clustering method, that is, the maximum walking distance that passengers can accept is 500m. This paper iteratively searches for all possible set of cable stations, searches for the most densely populated areas, classifies them as a class, and removes all these cable stations. This paper also performs iterative search on the remaining cable stations, iteratively iterates until it has searched a little into a category of stop, the remaining one for a class, through this algorithm can save Zhangjiajie tourism management of cable car cableway nearly 100 million yuan of investment. The minimum spanning tree and cluster analysis is to find the most branches in a connected network, that is, to find the optimal solution. Not only we can the minimum spanning tree approach and cluster analysis be used in the tourism industry, it is particularly effective in many service-serving companies, such as gas companies, power transmission companies, large corporations with multiple branches and the like. Greatly promote the development of smart rural tourism.

Acknowledgements

This work is supported by the Key projects for supporting outstanding young talents of universities in Anhui (gxyqZD2016574), 2016 Teaching quality of engineering construction project in Anhui--Tour Guide Operation (2016MOOC296).

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