The Optimal Route Planning Method of Road Network in the Peak Period of Tourism

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Abstract: In order to solve the problem that the current tourism route planning lacks independence and is difficult to meet the personalized needs of tourists, an improved dynamic tourism route planning algorithm based on multi constraint indexes is proposed. Firstly, the interest attraction set model and the feature inflection point set model are established to determine the multi constraint indexes, and the multi constraint indexes are integrated into the shortest path planning to design the dynamic tourism route planning The algorithm enables tourists to intelligently plan out the optimal tourist route after choosing the scenic spot by themselves or using the intelligent machine randomly. The example shows that the algorithm has the shortest output distance and conforms to the general rules of travel at the same time, satisfies the tourists' individual needs, and enables the tourists to obtain the best interests.

Keywords: Tourism; Peak period; Road route; Route planning

1. Introduction

Tourism route recommendation technology includes bus route query, driving navigation, peripheral information retrieval, route dynamic planning and other modules. This paper mainly studies the multi destination tourism route dynamic planning. Nowadays, the tourism market is becoming more and more mature, and the penetration of mobile Internet into the tourism industry is deepening. Self driving travel and free travel of individual tourists have become the main form of all kinds of tourism activities. Diversified and personalized "global tourism" and mobile tourism have become the new trend of tourism development. Scientific and technological tourism route planning helps to save time, save cost and improve user experience [1]. At present, the tourism route planning system (software) on the market only plans between the departure place and each destination, without multi-objective travel route planning function, which can no longer meet the needs of tourists for tourism route planning, and the multi-destination tourism route planning is still a blank. Through consulting and studying a large number of documents, this paper sums up and summarizes the relevant theories of tourism routes; investigates and analyzes the new demands of the current tourism market and the functions of the existing route planning system, and digs out the importance and urgency of multi destination dynamic route planning; through the quantitative analysis of the tourism process, this paper puts forward the mathematical model of tourism routes recommended by; based on the basic theory, this paper analyzes the current situation of the tourism market and the functions of the existing route planning system [2]. Ant colony algorithm and tabu search local optimization algorithm are used to optimize the proposed hybrid algorithm for tourism routes, and the accuracy of the improved algorithm is compared and tested; considering the impact of traffic flow on travel time, traffic impedance is introduced to plan the travel distance and real-time traffic flow [3]. The method of combination of induction and deduction, theory and practice, quantitative description and mathematical analysis is adopted to make the technical research of this subject more scientific, and a tourism route recommendation technology is proposed, which not only covers most of the functions of the current tourism route recommendation system in the market, but also adds the function of multi destination dynamic route planning. Finally, the function of multi destination dynamic route planning is introduced Several scenic spots are taken as examples to verify the relevant theories and tourism route recommendation technology.

2. The Best Route Planning of Peak Road

2.1 Route planning during peak tourism period

Take short-term experience tourism as the research object, and use According to the time-space correlation degree and travel time of the tourist destination, combined with the relevant models and algorithms, the paper designs, develops and realizes the short-term experience tourism route planning method, aiming at the characteristics of strong time constraints of the short-term experience tourism. Design and implement the short-term experience tourism route planning platform, realize the visual application of the short-term experience tourism route planning, and meet the time needs of tourists [4]. Combining the taxi track data, traffic data and the tourism route data uploaded by users, we can get useful tourism information through mining, and add time constraints into the traditional route planning methods, so as to realize the time sequence planning, which not only expands the application scope of the data, but also meets the needs of user experience tourism. Find out travel routes and make predictions. Based on graph theory, the data of scenic spots are mapped into directed weighted graph, and the node is used to represent scenic spots, and the edge is used to represent the channel between two scenic spots. Contralateral right refers to the time spent in visiting two scenic spots, including the time of visiting scenic spots and the time between visiting scenic spots [5]. On this basis, combined with the heat of the access point and the degree of correlation between the two points, we use the breadth first traversal strategy to search all paths that meet the time limit.

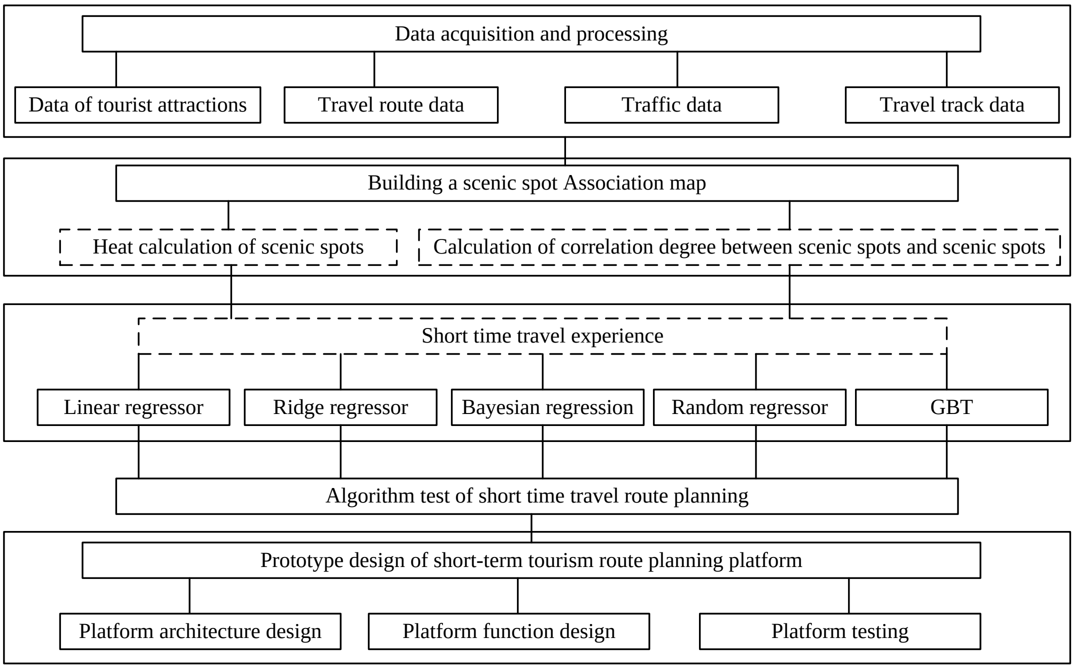

Figure 1. Route selection level in peak tourism period

In the hierarchical storage structure of travel peak route selection, the location with the closest storage location on all adjacent points usually refers to the location with the lowest subscript. During traversal, if the adjacency points of a node have been accessed, it is required to backtrack the visited nodes; if the graph is not connected, then all the visited nodes have been backtracked, and the unreachable nodes have not been found, it is required to subscript this point. Start interviewed detection, find the node T that is not accessed, and start a new round of depth search from t. On this basis, combined with the principle of neural network, the best route is selected as follows:

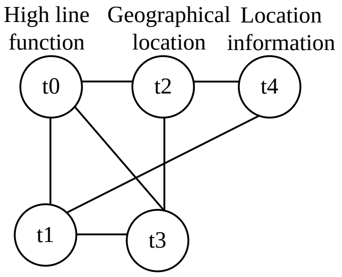

Figure 2. Route selection principle

In order to make the data meet the requirements of the follow-up algorithm, we need to process the original taxi GPS positioning data, including data cleaning, starting point extraction and grid processing. In the strategy database of qunar, the information of tourist routes uploaded by users is collected. Get links for time sequence, city, scenic spot number, and itinerary [6]. The tourism route data is used to establish the subsequent scenic spot Association map. The data of tourist attractions include the number of tourist attractions, the name of tourist attractions, the C Time value of recommended tour time, the type of tourist attractions, longitude, latitude, and the number of user comments. The database structure of tourist route planning is shown in the table1.

Table 1 Scenic spot route planning database

Field name	Explain	Example	Data type
ID	Attraction number	70240	Int(12)
NAME	Name of scenic spot	Bai's residence	VASRCHER
TIME	Recommended play time (seconds)	7400	INT(11)
TYPE	Types of attractions	1:2	VARCHAR(42)
LON	Longitude	IO6.45648	DECIMAL(10.4)
LAT	Latitude	29.48440	DECIMAL(10.6)
CITY	Route number	620	CARCHAR(200)
POILIST	Attraction number sequence	1	VASRCHER(12)
COMMENT	Comments	135	-
URL	link	http://zdlvyou.meijie2018.	-

2.2. Definition of optimal path selection

When tourists visit a certain scenic spot, they need to pass a certain block or intersection. Intelligent machines choose the best block or intersection, which can provide tourists with the best travel experience and meet the tourists' travel motivation. Here, the indicative characteristics and feature turning point set are defined [7]. It is an important premise for planning intelligent tourism programs to provide users with a convenient visual scenic spot selection platform According to the specific needs of tourists and the properties of the scenic spots themselves, this paper puts forward the classification standards and related definitions of scenic spots.

Definition 1: set of urban characteristic scenic spots Φ. Define the set of all scenic spots existing in the intelligent machine for the purpose of random selection of intelligent machine or subjective extraction of tourists in the urban space of the tourist city as the set of urban characteristic scenic spots, represented by Φ.

Definition 2: urban feature landscape subset Φ I. define a subset of urban feature scenic spots set divided according to criterion r in the urban space of a tourist city, as a subset of urban feature scenic spots, each subset represents a class of scenic spots, represented by Φ I, where I = (0, P] (z)) is the type of urban feature scenic spots defined according to criterion R, that is, P = (0, maxp] (Z +)

Definition 3: determine the city characteristic scenic spot element J. In this paper, we define any scenic spot of any urban feature point set within the urban space of a tourist city, which is represented by J. It is a scenic spot element under the Φ I that distinguishes different urban feature sets.

Definition 4: classify tourist attractions according to age structure, psychological needs, travel arrangement, characteristics and attributes of tourist attractions; the larger the value of Φ, P is, the more tourist attractions will be classified; the Φ I and elements of characteristic tourist attractions will be classified The quantity of J is determined by the number of tourist attractions that the city can accommodate. The specific algorithm is as follows:

$$\Phi_i = \left\{ \mathrm{p}\phi, | \Phi_i [\phi,], 0 < j \leqslant \max j, j \in Z \right\} \quad (1)$$

Definition 5: take the transport hub index Q1, transit transfer station index Q2, metro transfer station index Q3 and congestion index Q4 as the characteristic indexes, determine the various factors that affect tourists. Four characteristic index factors have an important impact on tourists' choice of routes and satisfaction of travel motivation. On the traffic road, the traffic flow between the starting point and the end point is expressed by matrix, that is, OD matrix.

$$\mathrm{OD} = \begin{bmatrix} 0 & q_{12} & q_{13} & \cdots & q_{1n} \\ q_{21} & 0 & q_{23} & \cdots & q_{2n} \\ q_{31} & q_{32} & 0 & \cdots & q_{3n} \\ \cdots & \cdots & \cdots & 0 & \cdots \\ q_{n1} & q_{n2} & q_{n3} & \cdots & 0 \end{bmatrix} \quad (2)$$

On the basis of the above algorithm, using the development framework of application display layer, business logic layer and data operation layer, the overall framework of short-term tourism route planning platform is designed and developed [8]. The application display layer is mainly responsible for the front-end display of tourism information visualization platform, and push the request sent by the client to the back-end. The application browser / server mode structure of the layer is implemented. The business logic layer is used to receive the request sent by the user and process the request. The data library layer is used to store and manage data. The storage medium is Oracle database. The system mainly realizes the interactive operation between the user and the platform, the visual display of the map of the tourism route data, and is used to display the platform data sent from the background, and receive the business information input by the user. Through the system, the user can realize the operation of the platform, and send the corresponding request to the business logic layer. The application display layer is mainly composed of HTML and CSS [9]. The business logic layer requests and receives data through ajax data asynchronous interaction technology. The map of the platform is implemented by the JavaScript API provided by Gaud map, which can display the route result information.

2.3. The realization of optimal path planning

On the basis of the above algorithm, using the development framework of application display layer, business logic layer and data operation layer, the overall framework of short-term tourism route planning platform is designed and developed. The application display layer is mainly responsible for the front-end display of tourism information visualization platform, and push the request sent by the client to the back-end. The application browser / server mode structure of the layer is implemented [10]. The business logic layer is used to receive the request sent by the user and process the request. The data library layer is used to store and manage data. The storage medium is Oracle database [11]. The system mainly realizes the interactive operation between the user and the platform, the visual display of the map of the tourism route data, and is used to display the platform data sent from the background, and receive the business information input by the user. Through the system, the user can realize the operation of the platform, and send the corresponding request to the business logic layer. The application display layer is mainly composed of HTML and CSS. The business logic layer requests and receives data through ajax data asynchronous interaction technology. The map of the platform is implemented by the JavaScript API provided by Gaud map, which can display the route result information. Based on this, it optimizes the traversal chart of the optimal planning and selection of tourism routes, as shown in the following Figure 3.

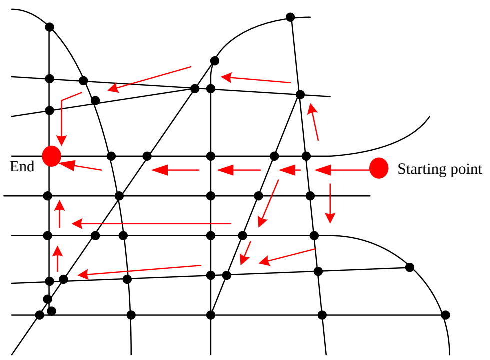

Figure 3. Tour route optimal planning traversal chart

All feasible routes satisfying time constraints in ergodic graph. In this paper, the breadth first traversal method is used to find all feasible routes that meet the time constraints. Search a node, first determine whether the time of the point exceeds the time constraint, if not, continue to search from the point, if it exceeds the 1-7 value of the time constraint, then get a group of feasible routes. After finding all feasible routes that meet the time constraints, the scoring attributes of each feasible route are determined. In order to build a personalized tourism route, we need to associate the user's preferences with the characteristics of each scenic spot. Our user preferences include two aspects: A. tourism season; B. personal preferences for tourism. Therefore, in order to associate user preferences with scenic spots, it is necessary to mine the characteristics of relevant scenic spots, that is, the characteristics of each scenic spot. Using travel notes mining technology to automatically obtain the features of scenic spots, mining technology to automatically obtain the features of beaches, monuments, bars and other scenic spots, the experimental part will give more examples. The challenge of using a place name table to name a scenic spot is to distinguish between a common place name and a scenic spot name. There may be several place names on the same longitude and latitude line, some of them have scenic spot names, some of them have common place names. How to automatically screen scenic spot names is a difficult problem. In order to solve this problem, we count the occurrence times of each place name in the travel notes. The more times, the more likely it will become a scenic spot. Considering the correlation coefficient between route and scenic spot, further optimize the route planning and selection steps, as shown in the figure 4.

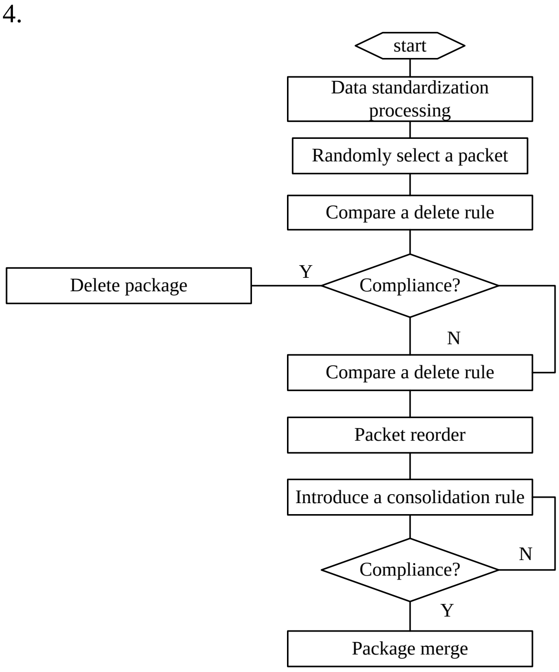

Figure 4. Optimization of optimal path selection step

Based on the above steps, the planning and selection of the optimal road route are carried out during the peak period of tourism to ensure the effectiveness and accuracy of the route selection to the greatest extent.

3. Analysis of Experimental Results

In the experiment, 12634 tourist route data are used as the test data set, and the mean square error, explanatory variance and RA score in 4.3.2 are used as the test indexes. Five regression models are tested, and the three test indexes and calculation time of the model are compared comprehensively. Finally, the best short-term tourist route scoring model is selected. The unified operation environment is as follows:

Programming language: Java;
Programming environment: jdk1.7, baidu map API:Myeclipse10 ;
Operating system: Windows 7;
Hardware configuration: Intel Core (TM) 2CPUE7300@2.93GHz ,8.0 GBRAM
The system uses web browser as the client to display the information of scenic spots and routes. Users can get the most popular route information and navigation information by inputting the starting point, destination and travel time on the map.
Based on the above experimental environment, the rationality of route planning is recorded. The specific test results are shown in the following figure5:

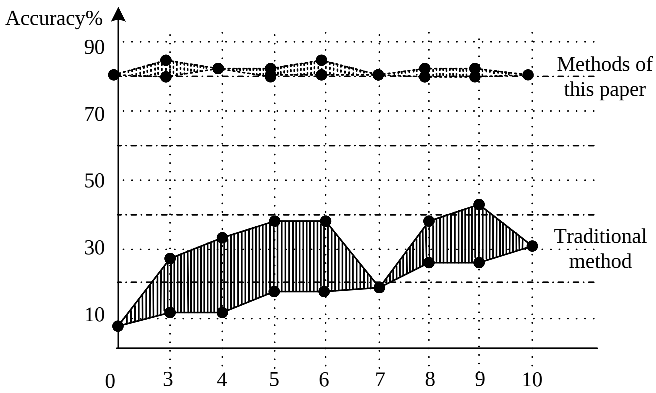

Figure 5. Comparison test results

Further, the practical application effects of the two methods are comprehensively analyzed, as shown in the table2:

Table 2. Comparative analysis of path planning effect

Index	Methods of this paper	Expected value	traditional method
Route distance (km)	387	389.4	278
Walking time (H)	3.8	4.0	3.6
Safety (%)	90.5	89	90.2
Cost	0.95	0.97	0.92
Comprehensive ranking	1	2	3

Compared with the traditional methods, the optimal route planning method proposed in this paper has better effect on route planning and selection in the practical application.

4. Conclusion

At present, in order to plan the tourist routes that meet the users' wishes, users need to consult a lot of travel notes, forums and other information, and conduct comprehensive analysis. In order to help users to automatically plan tourism routes and save time and energy, this paper proposes an automatic tourism route planning system based on user generated data, and on this basis gives a real-time route guide in scenic spots, which provides an algorithm for the realization of route integration in scenic spots. Through the effective integration of multi-user incomplete path, the internal path of high-quality scenic spots is mined, so as to overcome the randomness of user generated data, that is, the sparsity of user uploaded photos. The algorithm of real-time route planning is given. The real-time planning of tourism route is realized by using dynamic planning method and considering the factors of travel itinerary, travel stay time, user preference and so on. Based on the model, the interaction with users is realized, that is, users can add or delete scenic spots, change the input, or set the time of scenic spots. The effective algorithm of path retrieval is given. By using the bag of word like feature, the similarity between the two routes is compared, so as to realize the real-time navigation within the scenic spot. On the basis of the optimal route planning, an improved dynamic tourism route planning algorithm with multi constraint indexes is proposed. Considering the constraints such as the shortest interval distance, road hub index, bus station transfer coefficient, subway station transfer coefficient and road congestion index, the route with the lowest iteration value of dynamic recursive planning motivation is the optimal tourism route. The example shows that the algorithm can The route with the shortest output distance and in line with the general rules of the travel process can meet the personalized needs of tourists, so that tourists can obtain the best motivation to meet the interests.

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