Internet of Things (IoT) and Engineering Applications (2016) 1: 17-22
Clausius Scientific Press, Canada

Design and Realization of City Tourism Route Intelligent Programming System

Zhou Xiao[a], Zhang Yiming[b], Chen Li[c], Lin Haizhao[d], Zhu Shuai[e]

Information Engineering University, No.62 Kexue Avenue, High-tech Zone, Zhengzhou, Henan province, China

[a]zhou_laoge@163.com, [b]zzbgzgy@163.com, [c]clhj20130813@163.com,

[d]linhaizhao1102@163.com, [e]maple0081@aliyun.com

Keywords: city tourism; neural net; tourism route; intelligent programming; system development

Abstract: Travelers choosing tourism route subjectively is usually not optimal. Set neural net algorithm as data model, city tourism route intelligent planning system is designed and developed. The sampling method is used to select urban scenic spot, and intelligent programming algorithm is set up. The function and structure of the system are designed. Through system developing and function example analyzing, system's main function and auxiliary function are studied. Function test and user experience show that this system has good operation, while planned tourism route can meet the needs of most tourist group and obtain the maximum tourist motive benefits.

1. Introduction

For tourists, in what way they can visit all the selected scenic spots in the shortest time and get maximum tourist motive benefits, is the most concern. Nowadays, tourism geographic information system seldom contains intelligent tourism route planning service. Before visiting the city scenic spots, tourists get scenic spot and route information usually by surfing Internet, purchasing books, consulting online, etc., and then make self-decision[1,2]. Usually, tourist decision is not optimal. It is difficult to get the maximum tourist motive benefits. Therefore, programming tourism route by using intelligent method, providing decision support for tourists, is the trend of tourism geographic information system[3]. This paper develops tourism route intelligent programming system, which can help tourists make decision and get maximum motive benefits.

2. City Scenic Spots Sampling

Intelligent tourism route programming uses tourism demand as motive resource. Each tourist has his interests in certain scenic spots[4]. Set Zhengzhou urban scenic spots as data resource. Collect n scenic spots as superset Q. Classify scenic spots to 4 groups, labeled as Q_u, $0 < u \le 4$, including Q_1 park & green field, Q_2 play yard, Q_3 venue and Q_4 shopping and leisure. Each subset contains element scenic spots respectively, labeled as H_v, $0 < v \le \max v_{Q_u}$, shown in Formula 1.

$$\sum_{u=1}^{4} \max v_{Q_u} = n \tag{1}$$

Sampling scenic spots, and $n = 21$. According to attributive character, classify these scenic spots and get Zhengzhou scenic spot structure Fig.1 and scenic spot distribution Fig.2.

$Q_1 = \{ Q_1H_1$ Botanical garden; Q_1H_2 West lake park; Q_1H_3 Renmin park; Q_1H_4 Zijingshan park; Q_1H_5 Lvcheng square; Q_1H_6 Zhengzhou zoo; Q_1H_7 Bishagang park; Q_1H_8 Forest park$\}$;

$Q_2 = \{ Q_2H_1$ East District happy world; Q_2H_2 The water world; Q_2H_3 Century joy garden$\}$;

$Q_3 = \{ Q_3H_1$ Province museum; Q_3H_2 Aquarium; Q_3H_3 Erqi memorial; Q_3H_4 Municipal museum; Q_3H_5 Municipal science and technology museum$\}$;

$Q_4 = \{ Q_4H_1$ CC mall; Q_4H_2 Department store building; Q_4H_3 Daxue road Uanda; Q_4H_4 Qin Ling road Uanda; Q_4H_5 Pedestrian street$\}$

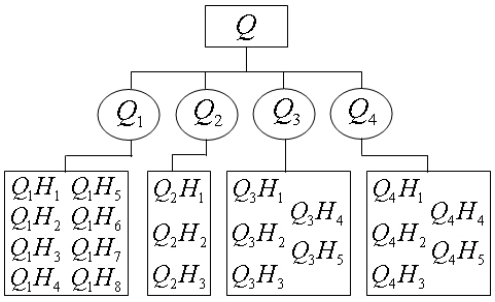

Fig.1 Structure of Zhengzhou city scenic spots

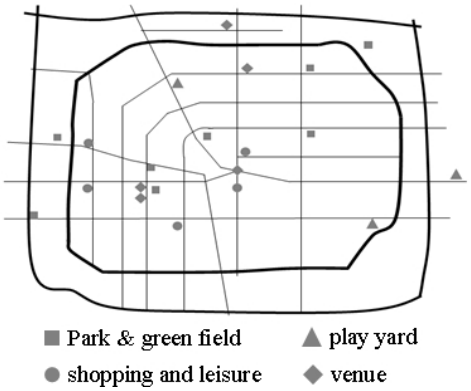

Fig.2 Zhengzhou Scenic spots distribution

3. Data Modeling and System Design

3.1 Data Modeling.

Define scenic spot set as T, in which there are k selected scenic spots T_1, …, T_k. Usually, tourist visits scenic spots in one-way sequence. There exists r impact factors influencing tourist motive such as interval distance, scenic spot star level, hotel quantity, restaurant quantity, convenience store and bus route quantity, etc. Factors have their own fluctuating value to promote or inhibit themselves. Set factor set as U, fluctuating value set as η, here are factors U_1, U_2 ,…, U_r and fluctuating values η_1, η_2 ,…, η_r. According to neural net iteration model, motive iteration output value is I, as formula 2 shows.

$$I_i = \sum_{0<i\le k} U_r I_{i-1} + \eta_r \tag{2}$$

Neural net iteration provides the condition of intelligent programming. Tourist motive value is iterated by motive factors. A_k^k tourism routes are determined by k scenic spots. Set

up $(2)\times(A_k^k/2)$ dimension matrix W to store A_k^k motive output value. Descend sort tourist motive output value in matrix W, and draw maximum value $\max I$ which is related to the optimal route.

3.2 System Design.

Here is the content of system design.

3.2.1 System Function and Structure Design.

In function, system realizes intelligent tourism route programming and ancillary function. Tourists rely on their own time and arrangement to select scenic spot subclass and choose certain scenic spots[5]. System intelligently calculates maximum output value $\max I$ to provide optimal route and suboptimal routes to make decision support for tourists. For the needed service in the tour process such as weather, tourism index, bus and subway information, railway and flight information, etc., tourists can look up information by themselves. In structure, system uses GIS two level design mode C/S. The main structure contains two layers, one is the subject of route programming function, and the other is auxiliary function. Each layer contains related subclass modes with different functions.

3.2.2 Data Model Design.

Geographic information data is various and plentiful. For the convenience of management and application, multi-classification databases are designed to store data. System contains three databases according to function needs, they are (1) Scenic spot information database and sub-database, (2) Traffic information database and sub-database, (3) Scenic spot buffer service information database and sub-database. They respectively store scenic spot attribute data and spatial data, bus and subway station information within scenic spot buffer, interval distance, taxi fee, traffic jam index, traffic light and crossroad quantity and traffic accident probability, etc., service attribute data and spatial data within scenic spot buffer. Data model is shown in Fig.4.

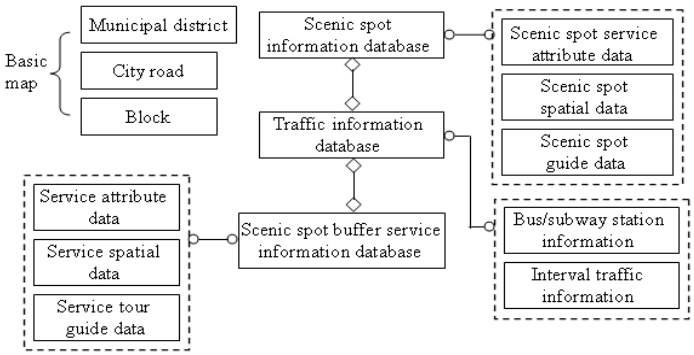

Fig. 4 System data model design

4. System Developing and Function Example

4.1 Developing Tool and Environment.

Develop system on the basis of designing system function and structure. Visual Studio 2015 platform, Access database and MapInfo map design software are used to develop system. System developing faces attribute data and spatial data and designs many interfaces to transfer data stored in Access database.

4.2 Hardware Environment.

System developing uses one server DELL PowerEdge 12G R720 with 12 G computer memory, equipped with large capacity hard disk 500 G. Output device is Canon iP2780 printer.

4.3 Software Environment.

Operating system is Windows 7. Programming environment is Visual Studio 2015. Database is Access database. Basic map charting tool is MapInfo map design software.

4.4 System Function Example.

System realizes intelligent city tourism route programming. It automatically calculates motive output value and intelligently chooses the optimal route. Meanwhile, it analyzes suboptimal routes and provides decision support for tourists. System function and related testing include the main function test and auxiliary function test.

4.5 System Main Function Example.

Tourists utilize the intelligent tourism route programming function to choose Q_1H_3 Renmin park, Q_3H_3 Erqi memorial and Q_3H_5 municipal science and technology museum. It automatically programs six tourism routes and visually displays as Fig.5 shows. According to intelligent calculation, the sequence $Q_1H_3 \rightarrow Q_3H_3 \rightarrow Q_3H_5$ can finally get the maximum tourism motive benefits. The other five suboptimal routes as well as the optimal route are all used to make decision support and the information is displayed in the system.

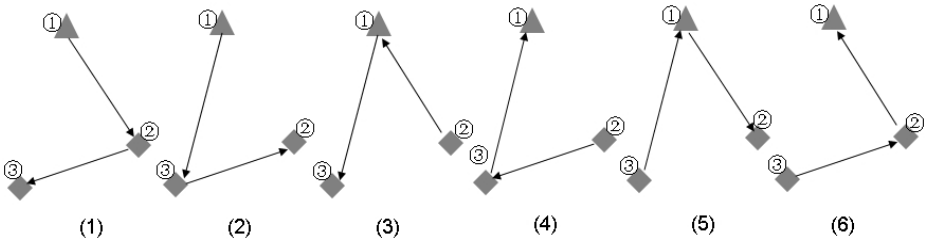

Fig.5 Tourism route programmed by system

4.6 System Auxiliary Function Example.

In addition to the main function, system realizes auxiliary functions, including the following auxiliary functions.

(1) Zhengzhou tourism information inquery

Tourists use "integrated information" function to know about Zhengzhou geographic location, administrative region, history and culture, natural scenery and cultural characteristics, etc. and special local product information.

(2) Classic attractions information inquery

Tourists use "Scenic spot information" function to choose scenic spots. All the selected information is displayed in visualization list box. Meanwhile, reset, delete and newly increase, etc. can be operated. Select any scenic spot and tourist can look up tourism information.

(3) Outdoor information inquery

Tourists can choose municipal district weather information, time frame weather, tourism index, etc. according to the needs. They can find information of bus and subway station, route, hotel, restaurant, hospital, convenience store and financial and postal service, etc. For the convenience of tourists traveling, system also provides railway and flight information inquery service.

(4) Thematic map service function

On the basis of decision support, tourists choose certain route. If map service is needed, system "Map setting" and "Map printing" can be used to print maps with tourism route charted on the map.

(5) Feedback function

Tourists can use "feedback" function to enter information input interface and type in feedback information for the developer. It is convenient for the developer to modify and improve the system.

5. Summary

Based on neural net model, this paper uses GIS hierarchy structure to develop city tourism route intelligent programming system. This system can provide intelligent tourism route programming function and related auxiliary function. The system has tough practicability, especially when tourists firstly come to an unfamiliar city, the system provides great convenience for them. Function test and user experience show that this system has good operation performance. Planned tourist routes meet the needs of most tourist group and can obtain maximum motive benefits.

Acknowledgements

Here I should appreciate my research group. They all did a good job in the research work and we worked together to complete the paper. Thanks to all of our members' help.

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