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Research on the Application of Geographic Information System in Tourism Management^{*}

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Abstract

The 21st century is the era of information economy. With economic development and social progress, people's material and cultural standard of living continues to improve and leisure time continues to increase, tourism has become increasingly popular as a kind of leisure way. The geographic information system applied to tourism management is the preferred platform of tourism information. On the basis of introducing the concepts of Geographic Information System (GIS) and Travel Geographic Information System (TGIS), this paper illustrates the role that the geographic information system plays in tourism management. Tourism has a strong geographical attributes. And GIS itself is information system offering services to geographic research and decision-making, which can play a role in tourism management. In particular, possessing the functions, such as data collection, storage, processing, spatial analysis and so on, GIS directly provides services for tourism management. The roles of GIS in tourism management are mainly in the following areas: conducting tourism information management; being able to produce a comprehensive thematic map. The paper analyzes the existing problems of GIS applications in tourism management. Take a panoramic view of the current technology and management system, the key technology and problems to establish TGIS are: the construction of tourism geographic information database; the establishment of data structure and the data model; the design of Tourism Geographic Information Database System. The essay also proposes the development prospects of the combination of GIS with new information technologies. GIS applied in Tourism Management has played a significant role. At the same time, it should be noted that information technology continuously changes, GIS applied in tourism management also need to improve according to the development of information technology to adapt to the information technology development. Looking the prospects of GIS applied in tourism management, the following areas need to be improved: RS, GPS as supplementary means applied to GIS data collection and update to enhance information collection ability of the system; combining the multimedia and virtual technology with GIS to enhance the attractiveness of the system for tourists; Combining the expert system technology with GIS to enhance the capacity of the system to solve travel problems.

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1. Introduction

The 21st century is the era of information economy. It is not the capital but the information knowledge plays a decisive role in the information society. With economic development and social progress, people's material and cultural standard of living continues to improve and leisure time continues to increase, tourism has become increasingly popular as a kind of leisure way. The number of tourists steadily increases. On the one hand, it promotes the vigorous development of tourism; on the other hand, it also brings new challenges to the traditional tourism management. There is the urgent need to improve management efficiency and modernization of industry standards. In this case, the geographic information system applied to tourism management is the preferred platform of tourism information. It can provide considerable travel management technology to ensure the effective and scientific tourism management. And it can enable more tourists to use the Internet to find travel information they need. Compared to the traditional access to travel information, the way that gets the travel information by the network is not only fast, informative, new content, but also low-cost and loved by the majority of young tourists, which greatly facilitates the travel of people and promotes the further development of the tourism industry.

2. The overview of geographic information system

Geographic Information System (GIS) is the emerging science that puts together geography, computer science, mathematics, statistics, management, surveying and mapping science into one. On the basis of geospatial data, supported by computer hardware and software, it collects, inputs, manages, edits, queries, models and displays spatial data. By using space model analysis method, it timely offers a variety of spatial and dynamic information to set up the computer technology system in order to serve Geography research and decision-making. Due to its efficient data management, spatial analysis, multi-factor comprehensive analysis and dynamic monitoring capabilities, it becomes an effective management decision-making tool, widely used in land management, urban planning, disaster prevention and mitigation, real estate development, commercial and other areas.

It is generally composed of hardware and software systems. GIS hardware system consists of computer equipment and network with some external device structure, in which the computer is the host of GIS. The external devices include input devices, output devices and data storage and transmission equipment. Network computing architecture determines the network devices. GIS software system generally consists of 5 sub-system, that is data input, data preprocessing, data storage and management, spatial analysis, data output. GIS's main features are: data collection and editing; data storage and management; data processing and transformation; spatial analysis and statistics; production and display of product.

3. The concept of travel geographic information system

The most fundamental of tourism is that tourists leave the residence to seek novelty. The most travel information and data have geographical attributes, which provide a basis for the establishment of Travel Geographic Information System (TGIS). It is the GIS system for the purpose of tourism management and services, the complete description of the concept of tourism information system consists of the following parts:

On the basis of geographic information database for tourism, TGIS uses the theory and methods of systems engineering and information science to collect update, manage, display, query, analyze, cartographic output travel data. It is the travel service system that put input, management and applications into one system. The research objects of TGIS are those information and data that are related to tourism

geographic information and data, such as transportation, accommodation, entertainment, shopping, cultural characteristics and features. The ultimate goal of TGIS is to provide timely, accurate and convenient services to meet the different needs of various users.

The development and design of TGIS should be guided by the regulations of tourism industry and be consistent with the exploring thought of tourism planners that comprehensively considers the tourism economics, marketing, aesthetics, sustainable development, psychology and other aspects so that meet the requirements of a wide variety of consumers.

4. The roles of gis in tourism management

Tourism has a strong geographical attributes. And GIS itself is information systems offering services to geographic research and decision-making, which can play roles in tourism management. In particular, possessing the functions, such as data collection, storage, processing, spatial analysis and so on, GIS directly provides services for tourism management. The roles of GIS in tourism management are mainly in the following areas:

4.1 Conducting Tourism Information Management

Under the situation of the continuous development of computer science and information technology, the information means time, efficiency and money. And accurate travel information can save the cost of travellers and improve the services and management level of tourism management sector. Currently, the applications of Internet and TV in tourism management have been very popular, but in terms of the depth of information technology application, the development of information technology in tourism management lags behind the overall level of tourism development. Tourism information resources are scattered and can not shared by all the tourists, and lack analysis of space multimedia technology during its exploring process, so tourists are not satisfied with its products. The GIS has both the information gathering and storage capabilities and the information analysis and processing functions, so that it can provide services to tourism management from two fields. Firstly, from the tourist point of view, GIS has powerful information storage features and can provide travel information inquiry service for tourists. Secondly, from the travel management service sector point of view, it can make tourism management more easily.

4.2 Being Able to Produce a Comprehensive Thematic Map

When travelling, if tourists have a comprehensive tourist map, they will be able to click to visit and get better travel services. The traditional tourist map are paper-based, because of space limitations, it is difficult to provide detailed scenic status. A very important advantage of GIS is that it has very powerful text and image editing functions and data maintenance is also very convenient. It can greatly reduce the cost of the plans and avoid the cumbersome process of traditional mapping. Compared to traditional paper tourist map, the advantages of GIS drawing tourism plans are obvious. Meanwhile, because of its tiered storage capabilities, tourists can not only output a map including all tourism elements, such as terrain, road transport, services, facilities, tourist attractions and so on, but also superpose one or a few elements and then output the map in the use of GIS. This brings the convenience to tourists.

4.3 Providing References for the Tourism Development

GIS has powerful spatial analysis function, which has been commonly used in urban planning. Similarly, GIS can also be applied to the tourism development. Using GIS spatial analysis capabilities

may do space analysis of the human and natural landscape, transportation, climate, topography, soil, vegetation, animals and plants in a particular region, which can help relevant departments draw the priority development areas, appropriately arrange the layout of the tourist routes, clearly define scenic protection zone and development potential, determine the extent of tourist attractions and provide references for tourism planning and decision-making. At the same time, GIS is also conducive to data mining, potentially serves travel management. From a large number of GIS stored data, tourism management department can get the information that is good for business operations and improving competitiveness by the use of data mining technology. Tourism planning departments can make further development and expansion planning and forecasting to tourist attractions based on the information.

5. The existing problems that gis applied to tourism management and the gis application prospects

5.1 Existing Problems

With the rapid development of information technology, the function of GIS software is more and more powerful, this provides technical assurance for the realization of TGIS network management. Because users (tourists and industry executives) have special requirements to the intuition, vividness and richness of the tourist information data, travel geographic information system should be distinguished from general information retrieval system. It requires the system to efficiently manage geo-spatial graphics, multimedia data and tourism feature attribute data, and users can quickly and easily achieve retrieval among the three. For policy-makers, it should also have tourism information analysis and processing capacity and realize the decision support functions. Therefore, based on tourism geographic information database, in the support of computer hardware and software and by using the theory and methods of systems engineering and information science, TGIS comprehensively obtains, stores, manages, analyzes and applies multimedia information systems of tourism geographic information.

In China, generally speaking, the tourism development of geographic information system is also lagging behind, most tourism activities are through travel agencies to organize group trips. Tourism management departments lack effective management of tourism information (guides) guidance system to independent travel that is increasingly on the rise, most independent travellers often finished tourism activities by their own personal knowledge and experience. Currently, it is shortage of tourism geographic information system that is established at the provincial level and put into good operation. Yunnan province is a typical example, there is relatively rich tourist information in its travel network, but researches seem to be rather weak in the fields of the expression of tourism spatial information and tourism sustainable development. Even if there are information systems in most provinces, the information is poor or the information systems even have not a simple computer site. These are clearly not suited to the requirements of tourism development in today's information age. In addition, there are many examples that geographic information systems development of regional tourism established in China, but they have various forms of shortcomings and deficiencies. For example, the ground three-dimensional display, the seamless integration of multi-source data, the best tourist routes design, the loading of multimedia information are difficult to meet the actual needs of users.

Take a panoramic view of the current technology and management system, the key technology and problems to establish TGIS are: the construction of tourism geographic information database; the establishment of data structure and the data model; the design of Tourism Geographic Information Database System. Currently the adopted vector and raster data structures have their own advantages and disadvantages. The mixed data only have two kinds of data which are stored separately, and the issues that how to juggle two structural characteristics are unresolved. On the other hand, the current decision-making sector has not enough enthusiasm for the construction of TGIS. Therefore, the design and

development of TGIS should be gradually extended at this stage. The system can be put into use with the initial function; and during the running of the system, the functions should be gradually extended by continually attracting capital, and ultimately realize the long-term operation of TGIS.

5.2 Prospects of GIS Applied to Tourism Management

GIS applied in Tourism Management has played a significant role. At the same time, it should be noted that information technology changes continuously, GIS applied in tourism management also need to improve according to the development of information technology to adapt to the information technology development. Looking the prospects of GIS applied in tourism management, the following areas need to be improved:

1) *RS, GPS as Supplementary Means Applied to GIS Data Collection and Update to Enhance Information Collection Ability of the System*: RS has stronger functions in the fields of destination space information collection and image processing of tourist attractions; GPS plays the larger roles in orientation in space and data collection of natural tourism resources, it can be used to quickly obtain the parameters of ground control points and it can also be used for measurement to obtain spatial information data. The RS, GPS and GIS applied to tourism management simultaneously enable the system to automatically acquire, process and update tourist information data, dynamically update information in the database at any time so that tourists will be able to more timely and accurately get tourism information. This is convenient for tourists, and further improves the level of tourism management.

2) *Combining the Multimedia and Virtual Technology with GIS to Enhance the Attractiveness of the System for Tourists*: Multimedia combining audio, video, image and text into together enriches the function of the system and enhances the visibility of the system. While a variety of showing forms is very beneficial to tourists to get all the required tourist information. On the other hand, by using virtual reality technology, imitating the scene area and displaying the area by three-dimensional forms make travellers more intuitively understand tourism information and enhance the interest of tourists, then better play the GIS's roles in tourism management.

3) *Combining the Expert System Technology with GIS to Enhance the Capacity of the System to Solve Travel Problems*: Expert system is a computer system that is set up on knowledge-based programming method. It comprehensively integrates the experts' knowledge and experience in a particular field and can use the knowledge like an expert to solve complex problems that only the experts can solve by the process of reasoning imitating experts to make decisions. In the process of GIS applied to the tourism management, make use of expert system evaluation system to establish tourism resources evaluation system, landscape assessment and recovery system and ecological environmental protection and inspection system so that rationally develop and utilize tourism resources and scenic resources.

6. Conclusion

The development of tourism not only needs its own information management and exchange, but also adapts to the economic development and information needs of the whole society. The GIS applied to the tourism management is the inevitable demand for tourism management and tourism development. The development of modern information technology constantly presents new challenges to tourism management. In this case, it is a very important problem that how to make full use of the GIS in the tourism management to make tourism management better adapt to the needs of Information development. It requires ongoing in-depth discussion and study.

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