Scientific Research

Applications of "3S" Technology for China's Tourism Planning and Management

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Abstract: The progress of remote sensing (RS), geographic information system (GIS) and global position system (GPS) in China since the early 1980s.The first section introduces the applications of remote sensing to environmental monitoring and resources investigation in tourism. The second section focuses on further analysis of the applications of geographic information system from the point of view of visitor management, facility inventory and resource use and emergency early warning concerning unexpected tourist disasters, taking Beijing, Fujian as examples. The applications of global position system in tourism are discussed in the third section. As "3S" technology develops, they will be combined for use in China's tourism planning and management.

Keywords: "3S" technology; tourism; China

With the economic development, information is becoming more and more important in tourism. The utilization of advanced technology to tackle the complicated tourism planning and management is absolutely necessary. In recent years, remote sensing (RS), geographic information system (GIS) and global position system (GPS) have been used in China's tourism. This paper deals with the application of the "3S" technology to China's tourism.

1 Tourism and remote sensing in China

Towards the end of the 1960s, the Chinese central government drew up a plan for remote sensing technology in China. Since then, research and development of remote sensing sensors have been included in the National Five-Year plans. The new remote sensing technologies have been applied to resource exploration and environmental monitoring [1]. RS and tourism share a common characteristic, that is both cross the boundaries of disciplines and application areas. RS has been applied in many disciplines including geography, geology, urban planning, ecology, and environmental studies. Similarly, tourism has been a subject of interests to geographers, economists, business, environmental planners, anthropologists, and archaeologists. As such, the potential for RS applications in tourism is significant. According to many case

studies of China's tourism, it can be identified that the current applications of RS in China include the following aspects: (1)to determine the physical environment and the location of the tourism destination, especially the remote destinations of Chinese southwest and northwest; (2)to investigate tourism resources quantity and quality, which has been adopted by several tourism investigations in some Chinese provinces; (3)to draw all kinds of integrated tourist maps for the tourism planning, including the map of tourist resource, the distribution map of tourist place，landscape pictures, literal introduction, advertisement, etc; (4)to employ the technology of virtual reality and remote sensing data to make dynamic tourist planning, which can facilitate the production promotion and marketing to the potential tourists; (5)to use it as the strong data source of GIS to make tourist planning geographic information system to service for the tourist decision and the host environment.

For example, using the technology of RS，and combining the image characteristics of SPOT-5(Systeme Probatoire d'Observation dela Tarre-5)，the forest tourism resource of Nankun mountains located at west part of Longmen county，Huizhou of Guangdong province was surveyed. The information of geologic environment terrain，economy and culture in the study area were collected. The remote sensing images were processed，and the interpretation signs were formulated. The forest eco-tourism resources of this region were interpreted and extracted through field survey and correc-

tion．On the basis of survey，the different types of resources were analyzed and evaluated[2].

2 Tourism and geographic information system in China

GIS is now recognized widely as a valuable tool for managing, analyzing, and displaying large volumes of diverse data pertinent to many Chinese local and regional planning activities. Tourism is a highly complex activity, and thus requires tools that aid in effective decision making to come to terms with the competing economic, social, and environmental demands of sustainable development. Applications of GIS in tourism and recreation planning illustrate that GIS is a strong and effective tool that can aid in tourism planning and decision-making.

The following are a number of opportunities for GIS applications in tourism planning [3]:

(1) Visitor flow management: This involves the use of GIS to identify principal tourist activity spaces within a destination and the flows among destinations. Authorities may implement strategic plans for superior infrastructure (e.g., building public transportation systems linking various tourist activity spaces).

(2) Facility inventory and resource use: This involves the use of GIS in connection with the issue of environmental justice (namely the fact that tourism may not benefit all segments of society equally). It also involves developing an inventory of resources in order to identify conflicting but also complementary land uses and activities, available infrastructure, and natural resources.

(3) Assessing impacts of tourism development: GIS can be used to demonstrate tourism impacts on various industrial sectors in a time-series and spatial format [4]. Within this category, analysts can use all or several of the previous categories by employing the "what-if" tool of GIS. This tool allows the development of scenarios for predicting what the effect of a change in a certain variable will be in the destination.

The power of GIS lies not only in the ability to visualize spatial relationships, but also beyond the space to a holistic view of the world with its many interconnected components and complex relationships. Due to the complex nature of tourism planning and management issues, the potential of GIS in resolving these issues is increasingly acknowledged, especially in Chinese developed area——Beijing, Shanghai, Shenzhen and so on, because the '3S' technology will be very useful to meet the tourists' need and resolve the non-sustainable problems of tourism in developing country. For example, people who want to go sightseeing in different places as tourists may need to have some information about those places. Determining the shortest routes to the historical places and natural beauties from their accommodation will be both timesaving and economical.

Geographical Information System (GIS) technologies provide us with these possibilities. In a lot of Chinese case study, GIS design and network analysis were carried out by taking advantages of GIS possibilities for tourism. In addition, Impact assessment and simulation are increasingly important in China's tourism development, and GIS can play a role in auditing environmental conditions, examining the suitability of locations for proposed developments, identifying conflicting interests and modeling relationships.

Some Chinese researcher set up the geographical information system of China tourist flows by tourism geography and GIS methods, analyze the relativity among the space time structure of tourist movements and flows distribution and environments and social and economic factors, and set up trends monitor and prediction model of tourist movements and flows on basis of establishing quantity evaluating method of tourist flows for analysis and prediction of tourist movements and flows to offer scientific evidence. The method can change the traditional phase of depending only on statistical data and manual work to investigate tourist s information. It can be used to acquire scene information, tourism road information, tourist number, position information rapidly and accurately. It is useful to realize the real-time of acquiring tourism information, control tourist s flow in time and take scientific measures.

2.1 case of Beijing Tourism Information System

Research by Zhouxinwei introduces how to design and develop Beijing Tourism Information System based on

GIS, including the design of database, structures and functions. SQL Servers 2000 is used to manage the database of this system. The front2end application platform is developed under the circumstances of VB. This system uses ADO dynamic data to connect engine to implement data communication and utilizes Map Objects component and embedded integration mode. Finally, it implements the integration of the basic geographic information function and special application such as space query and tourism programming, etc [5].

2.2 case of tourist information system of Fujian

On the basic platform of GIS technology and with the help of computer network and database managing technology, Chenjing analyses the information of Fujian tourist activities. By collecting, storing, managing, calculating and figure processing, the paper exhibit comprehensively the system processing result by means of figure, words, voice and image. In this way, they provide reliable evidence for the development of Fujian tourism [6].

2.3 Case of emergency early warning concerning unexpected tourist disasters

Yangjianbo discusses the application of Web Service/Web GIS in the information system of emergency early warning concerning unexpected tourist disasters. By adopting Client/ Server hierarchy, language scale RDBMS (relational database management system), Geographical Information System software Arc/Info combined with relevant program languages, the system is achieved. The whole system is Web information publication system. It discusses the system's const ruction, system function, realization of technology of Web-GIS. It offers effective support for tourism management, exploitation and protection of tourism resource, publicity and government decision - making. This system will enable its related customers to share information in case of emergency, and thus improves its promptness, sensitiveness and efficiency of decision-making in emergency early warning. In terms of service offer, this system focuses on all the space data and their construction and re-occurrence of their application models. Based on these

models and the relevant data bases, target-oriented package is made for various application services. Relevance model banks and data bases are constructed in this system [7].

3 Tourism and global position system in China

GPS system used in China's tourism is relatively less than GIS, and it is mainly employed by adventure tourism activities. At the same time, there have been some Chinese planers who try to use it for tracking the tourist location in the large desert and forest tourism area; besides, GPS technology is also used for the ecotourism visitors to investigate the migration of birds. Applying GPS to tourism management may raise modernization degree of tourism enterprise and safety degree, develop new tour fashion, it will bring new development foreground for our province tour business.

GPS devices have the advantage over land-based tracking methods when it comes to obtaining accurate data. This makes them a suitable means to be used in micro-level investigations, such as studies which record the number and density of tourists visiting historic cities, attractions, theme parks, and the like, all of which demand high-resolution data [8].

3.1 Case of Hongjiang

Tourism resources investigation is the basis of regional or scenic tourism planning, and the effective integration of tourism resources serves as a prerequisite of the sustainable tourism development. The inefficiency and backwardness of traditional investigation and evaluation hardly guarantees an effective constitution of tourism planning. Employing GPS and GIS for data collection and management, is now a new method for investigation, evaluation and management of tourism resources. Lin Jie takes the master plan of tourism development of Hongjiang, Hunan Province, as an example to explain how to use handheld GPS for data collection in tourism resources investigation. Combining the functions of data management with spatial analysis of GIS, Hongjiang's tourism resources are evaluated and integrated，

based on which some suggestions are given to Hongjiang tourism development[9].

3.2 case of chinese tourism company

Some Chinese tourism company offers boat trips along rivers, lakes, and bays, and equips their boats with GPS. Then the actual track of each trip could be recorded and be made available for users to view. It would be possible to display not only the path taken, but also the speeds reached. The route data could be made available as an image displayed on the internet or for mapping software.

4 Conclusions

In summary, tourism has been considered to be one of the crucial industries in China due to being source of income. It also enables people from different cultures to interact with each other. Therefore, the planers and managers must be conscious of tourism and make use of "3S" technology directed towards tourism effectively. At last，with the increasing attention paid on tourism development in China, the other theoretical and empirical contributions of 3S to tourism planning and management are given a prospect on the more widely applications. However, because of the highly data-driven applications of "3S", its use by tourism and recreation professionals have been very limited. This is mainly due to lack of

long-term, comprehensive, and systematic data on tourism issues. Currently, "3S" application in tourism has been much restricted to inventory and case illustrations. With consistent spatial data on tourism locations, characteristics of these locations, and long-term visitor use data, its applications will grow significantly.

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