Discussion on the Architecture Design of the Evaluation Management of Early-Warning Information System of Eco-Tourism

Xue-ping Zhang, Jian-xin Wang, Song Lin and Sheng-Quan Ma

Abstract Since 2005, the United Nations released the report, globally integrated assessment of ecosystem change, human welfare and strengthen the protection of ecological system of feasible countermeasures, received extensive attention and in-depth study, especially in the rapid development model and environment system and human system integration together, evaluation of eco-tourism management system to be dynamically analysis of changes in ecological tourism environment evolution in reverse trends and consequences of evolution, ecological tourism environment deterioration rate, deterioration trend is forecast, and the possible consequences of warning. The eco-tourism evaluation architecture management early-warning information system was designed; the system design principles, design goal, system structure, system function, system security, and other issues are discussed in detail; the theoretical foundation for the implementation of the development of the system is established.

Keywords Eco-tourism · Assessment management · Early warning · Information system

1 Introduction

Eco-tourism is a complex system of dissipative structure, involving a number of areas of natural and human component, its internal material flow, energy flow and information flow is extremely complex, The geographical information system (GIS) systems for research eco-tourism matter and energy in the movement and

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transformation of geospatial provide scientific space management and analyst is tools [2]. Therefore, the introduction of eco-tourism warning of GIS research, GIS and other modern geographical information technology support, thetas abolishment of a suitable ecotonal Massenet and early-warning evaluation index system and model analysis system to evaluate the overall quality of the environment Eco-tourist status and evolutionary trend, reflecting the Eco-tourie environmental threats to type, intensity and distribution in space and provide environmental quality Eco-tourism development trend sand the speed of information, Build Eco-tourism assessment management early-warning information system (Eco-tourism Assessment and Management (EAM) Early-warning Information System, short for EAMEWS).

Assessment of eco-tourism management early-warning information system's main task is forevermore evolution for eco-tourism environment trends and consequences of the evolution dynamics analysis, the rate of deterioration of eco-tourism environment, deteriorating trend forecasting, etc., and the possible consequences for alerts [3].

2 Design Principles and Objectives of EAMEWS System

2.1 Design Principles

Practical principle: System should be close to the user, according to the end-user business level application interface design system, menus, commands, concise, and friendly;

Advanced principle: System construction should give priority to the latest version of the latest technology, computer, and peripheral-equipment-based software;

Portability principle: To adapt to the ability of software and hardware system, we should establish information classification, data structure, technological process and equipment and a series of related standards, norms, rules and conventions, to ensure compatibility between systems;

Scalability principle: The construction of the system should have the foresight, and the system design to the reserved interface, application system functions, data management, system hardware, and software can be extended.

2.2 Design Objectives

1. Implementation of eco-tourism environmental background information retrieval

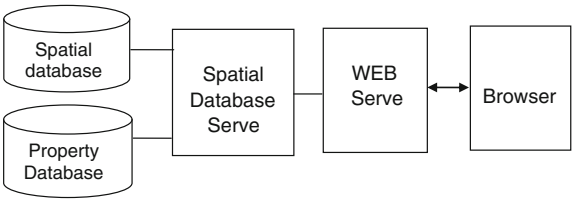

Fig. 1 System network topology frame in system

Design and establishment of standardization, standardization of basic information database, the database includes the oasis basic conditions, basic information such as the natural environment, environmental pollution, the distribution and utilization of resources, population distribution, economic development and other aspects of the implementation of ecological tourism, environmental background information query and retrieval;

2. Achieve generality in the practical basis

To further improve the system design should not only consider the experimentation area information supplement and update, function, but also consider the database design versatility, emphasize system popularization value. The system is not only a practical system, but also a typical example of the system, and the system can be extended to the development pattern and the experience of other regions and experimentation area, facing similar problems (Fig. 1).

3 System Structure and Function Design [4]

3.1 Network Structure Design of System

WebGIS is a GIS network based on Web technology standards and protocols, and it uses Web technology to expand and improve GIS. WebGIS compared with the traditional GIS, which has access to a broader range of spatial data and can be released, makes it easier for users to find the required data, graphics, and attribute data query and retrieval. Because of the implementation method provides various space models on the server, the parameters of the model through the browser receiving user input, the results will be returned, so not only can release spatial data, also can release the space model of service. In the construction of ecological tourism early-warning information system involves many departments, establishes the system structure of Browser/Server structure, based on Web has the capability of distributed computing, in favor of data updating and maintenance, improve the early-warning information, it is not only for the decision-making departments, the general public can easily browse and query of eco-tourism environment and early-warning information, greatly improve the system of social benefits (Fig. 2).

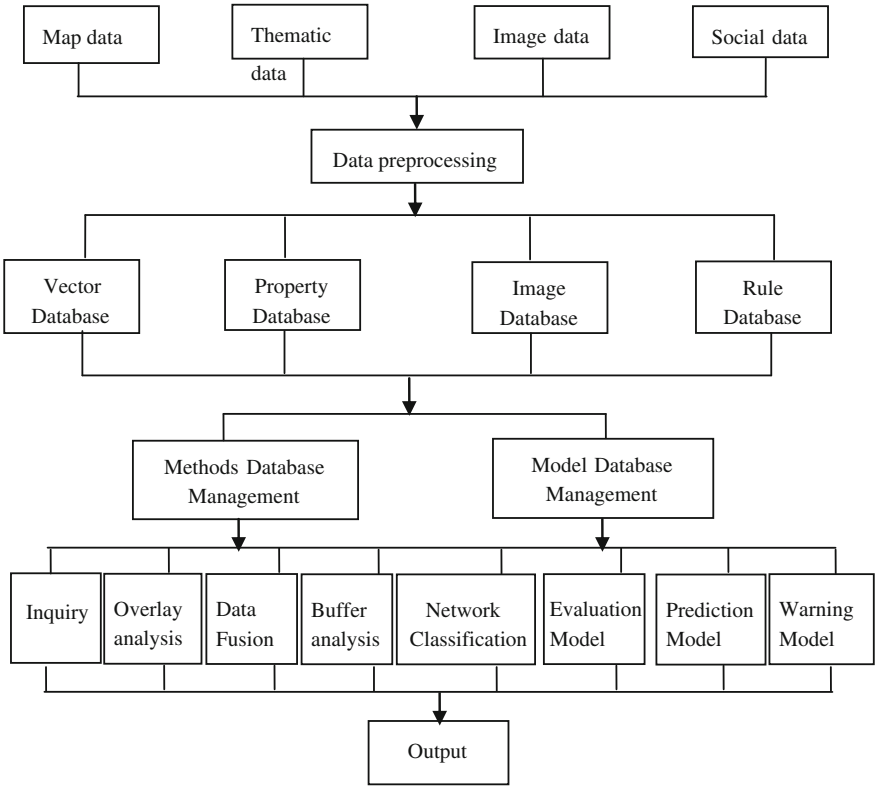

Fig. 2 General logic frame of system

Ecological tourism early-warning information system network topology structure design on the basis of data distribution in various administrative units formed characteristics, taking into account the design basis of the existing network. The whole system is divided into two parts: server systems and client systems. The server system consists of the application system, Web server, and the spatial database; client system consists of operating system, network software, and browser.

3.2 System Logic Structure Design

The function of EAMEWS by the GIS spatial analysis tools, database system and model base system consists of three parts. The database system consists of vector graphics libraries, image raster library, and attribute database; remote sensing image data mainly include the basic situation, natural environment of oasis resources condition, economic and social conditions, and various statistical data

and corresponding geographical unit and also data in the form of a management file, to facilitate data editing, querying, and updating; spatial analysis tools mainly refers to the basic space GIS itself has the function analysis, comprehensive analysis, chart analysis, spatial overlay analysis and a variety of simple statistics analysis including spatial information conditions; model base system is in the GIS model library based on, using advanced programming language VB, VC++, two secondary development language to develop each function module of GIS based, and model system for regional ecological tourism warning to specific integration, including the trend model, evaluation of ecological environment quality forecast model, AHP model, gray prediction model and the fuzzy comprehensive evaluation model, analysis to support system model. Using the GIS view shows the results of analysis and thematic mapping function output model evaluation, and ultimately the formation of the data input, information management and maintenance, model evaluation and early-warning information ecological tourism output of a complete early-warning information system.

3.3 System Function Design

According to the design goal and the principle of the early-warning information system, combined with the overall design of the system structure and function results, determine the main subsystems of the system should include; basic data subsystem, spatial query and retrieval subsystem, ecological assessment of early-warning subsystem, data output subsystem and system help subsystem five main function module.

Basic data subsystem: Establishment and maintenance of the system database, including spatial database, attribute database, society, economy, population, resources, database creation, maintenance, and update. Viewing using GIS basic display function provides the visualization of data, to provide services to the early-warning decision information.

Spatial retrieval subsystem and query: This system is one of the important functions of early-warning system, including from space to space query attributes and spatial location according to the properties of the data logic query, namely the picture-text bidirectional query, and statistical analysis of query results. If the query a class object within the scope of a certain space attributes, or query in some area of objects satisfying certain conditions. Relevant maps and related attribute data are stored in the database, to facilitate the maintenance and updating of data.

Ecological evaluation of early-warning system: This is a core function of early-warning system. In GIS development language and high-level programming language support, the establishment of the ecological and environmental warning need model, forecast evaluation, current situation of ecological tourism environment trend analysis and major natural disasters, form a system of early-warning model of unified, provide the service of ecological environment early-warning

information for utility area people and the government. The formulation of regional decision-making sector planning is important.

Data output subsystem: Early-warning information of the data output can be in text and tables, statistical mapping, mapping, and other forms of expression. Compared with the traditional methods, under the support of GIS data output to improve the accuracy and efficiency of the data analysis, the procedure is greatly simplified. And the use of GIS visualization function, can display multidimensional thematic elements, strengthen the early-warning information expression ability, early-warning information more convincing.

4 System Security Design

Ecological tourism early-warning information system network covers a wide range, many users, because early-warning data confidentiality requirements, which should be aimed at different user password access, according to different levels, according to the user's authentication results, corresponding user interface. Design of access permission level is divided into three levels: advanced user level, administrator level, and system and general Internet user level. The system administrator has the highest authority to access the early-warning system, which includes the early-warning information system daily maintenance and management, early-warning model construction, metadata management and managing other users of the system; system advanced user is early-warning network center and network node of each work station, to maintain and update the data to the database, you can request send warning center, the application of early-warning and forecasting model for online analysis, and can realize the distribution and update the warning information on the Internet; general customer for the majority of Internet users, can use the Internet to the client browser environment information, early-warning information retrieval and thematic map output.

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References

1. Zhao, S.D., Zhang, Y.M.: Concepts, contents and challenges of ecosystem assessment-introduction to ecosystems and human well being: a framework for assessment. Adv. Earth Sci **19**(4), 650–657 (2004)
2. Liu, J., Li, J.: Computer system assisting the implementation of tour information prediction measure. J. Huazhong Norm. Univ. Nat. Sci. **38**(2), 245–254 (2004)
3. Li, Y.: Case-based reasoning technology in tourism planning decision. Inquiry Into Econ. Issues **10**, 115–117 (2004)

4. Yin, G., Chen, Y.: Computer-aided design and manufacturing technology. Science Press, New York (2000)
5. Low, B.T., Cheng, C.H., Motwani, J., Madan, M.S.: Expert systems in the service industry. A comprehensive survey and an application. Int. J. Comput. Appl. Technol. **10**(5–6), 289–299 (1997)