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Ecological Strategies for Rural Nature Conservation Environment Based on Big Data Information System

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Abstract: With the emergence of environmental pollution problems and advances in science and technology, natural resources and ecosystem functions that are not usually considered valuable are now of increasing importance for economic development and the improvement and enhancement of the human living environment. The purpose of this paper is to study the ecological strategy of rural nature protection environment based on information system. The main function of designing rural environmental information system is the object of study, and the geographic information system technology, computer technology, database technology and professional software ArcEngine are discussed and studied, and the function of rural environmental information system is designed by combining the characteristics of M rural. Through the establishment of digital rural environmental information system, the development dynamics of the countryside can be analyzed quantitatively. The experimental results show that the system can accurately analyze the rural environment.

1. Introduction

The issue of environmental justice is a major problem that needs to be solved in China, and it is of great practical importance to achieve a dynamic balance between economic and environmental construction and to guarantee the coordination of environmental interests among relevant environmental subjects [1, 2]. In the special space of the countryside, the mismatch between the richness of natural resources and the degree of ecological and environmental protection, and the inequality in the enjoyment of environmental rights and the assumption of environmental risks between the disadvantaged and the powerful groups make the rural ecological planning oriented by environmental justice particularly important [3, 4].

Rural ecological planning has been an important part of domestic and international research, and

its research focus has gradually shifted from simple ecological technology and special design research to the study of planning operation mechanism [5].Victor Chang, from the perspective of ecological strategy, through literature review and field research, has studied Kangaroo Village in Huizhou District, Huangshan City from the aspects of village location, street space, water environment, individual construction, and folk culture, etc. A detailed study was conducted. This aspect describes the ecological attributes of the village. The necessity of harmonious development of human and nature is fully considered. This is not only a valuable ecological heritage left by the ancients, but also a certain reference for building villages and towns [6].Anandakumar Haldorai took the national poor village Luoyun as the research object and proposed corresponding countermeasures for the construction of ecological civilization in national poor villages from the perspective of ecological environmental protection [7].Stephan Hutterer established from the perspective of information technology the rural The big data logic of strategic planning and decision-making for revitalization helps to improve the scientific and efficiency of strategic planning and decision-making. From the data dimension, decision element dimension and process dimension, a process decision and effect evaluation model of rural revitalization based on "big data and three tables wisdom system analysis" is constructed. The countermeasures for the implementation of rural revitalization strategy under the logic of big data were proposed [8]. Rural ecological planning is the practice and application of ecological planning in rural areas, and it is also an important social change in the process of rural development, which belongs to the category of ecological construction.

In this paper, a management information system that comprehensively promotes and analyzes the role of land trust is constructed by introducing GIS technology in rural M, which fully reflects the advantages of GIS technology. After the construction is completed, on the one hand, it can promote the local management of agricultural and forestry resources and provide support for managers' decision making, and on the other hand, it can significantly improve the digitalization of village M. to adapt to the future ecological strategy of the rural nature conservation environment.

2. Research on Ecological Strategy of Rural Nature Conservation Environment Based on Big Data Information System

2.1. Innovative Ecological Planning Strategy

The traditional decision-making approach can be gradually promoted to the use of network technology, S-technology, artificial intelligence and other advanced technologies to establish a decision support information system serving ecological planning [9, 10]. First, to establish a rural ecological planning information collection center, which is responsible for coordinating the construction of decision support information system and ensuring the effective operation of the system construction; second, to adopt automatic monitoring technology, computer security, 3S technology, and data storage technology. , establish a network platform for sharing ecological planning information resources, including information collection, storage and sharing, to provide data support for rural ecological planning. Finally, using virtual reality, system simulation, and artificial intelligence technologies, a decision support model that incorporates the reality of rural ecological planning is established, integrating sectoral planning requirements and related issues, especially the needs of vulnerable environmental groups, and establishing a support model. To improve the scientific and fairness of rural ecological planning [11, 12].

2.2. Spatial Data Organization

The process of grouping, storing, and processing data according to certain ways and rules is

called spatial data organization [13, 14]. Raster/vector data structure, this structure form is usually the most used one spatial data structure model, this hybrid structure model has two benefits, the first is to make the spatial information and attribute information related to both vector data and raster data expressed accurately, it is necessary to establish a form of mathematical expression, i.e., spatial topological relationship and discrete; the other is he can be very fast processing data. So in this paper the structure used for the organization of the rural environment database in a grouped and hierarchical directory way is the raster/vector data structure [15, 16].

2.3. Information Statistics

Whether it is cell statistics or partition statistics or domain statistics, all three statistical methods belong to the information statistics of spatial databases. For example: to calculate the area of a certain plane, the first step is to count the cells, and the statistical analysis corresponding to a specified cell within the adjacent range of the cell to be counted is called domain statistics, while the statistical analysis after partitioning the data set is called partition statistics. Usually the spatial data of statistics are output in the following forms: in the form of bar charts, in the form of excel tables, and in the form of graphs [17, 18].

3. Investigation and Research on Ecological Strategies of Rural Nature Conservation Environment Based on Big Data Information System

3.1. System Development Environment

Due to the large amount of underlying data of the system, in order to better render the 3D real-world model and restore the realistic scene, the hardware configuration during the development of this system is shown in Table 1 below.

Table 1. Development environment configuration

processor	Intel Corei7-9700K@3.60GHz eight nuclear
display card	GTX 1660 Ti(6 GB discrete graphics card)
internal storage	32 GB
disk space	12gb solid state drive

3.2. Database Model Selection

Geodatabase is used to represent geographic location information and DBMS is the database management system standard, which manages and stores geographic information in standard DBMS tables. Geodatabase is supported by Geodatabase. And the size of Geodatabase is very flexible and can be adjusted, and all the attribute data and spatial data are stored in the relational database.

3.3. Evaluation Model

(1) Diversity index (H)

The ecological diversity index is calculated as follows:

$$H = -\sum_{i=1}^{m}(Pi \times InPi) \tag{1}$$

Formally, h represents the ecological diversity index and m represents the number of ecosystem types.

(2) Uniformity index (E)

describes the degree of uniformity in the distribution of components in the ecosystem and is calculated by the formula

$$E = H / H\max \tag{2}$$

h is the ecological diversity index and Hmax is the maximum possible homogeneity of the ecosystem for a given abundance.

4. Analysis and Research of Ecological Strategies for Rural Nature Conservation Environment Based on Big Data Information System

4.1. Overall Architecture of System Design

By analyzing the current situation of carrying out digital engineering and combining the development status of computer technology and geographic information technology, the main functional framework of rural environmental information system is designed, as shown in Figure 1.

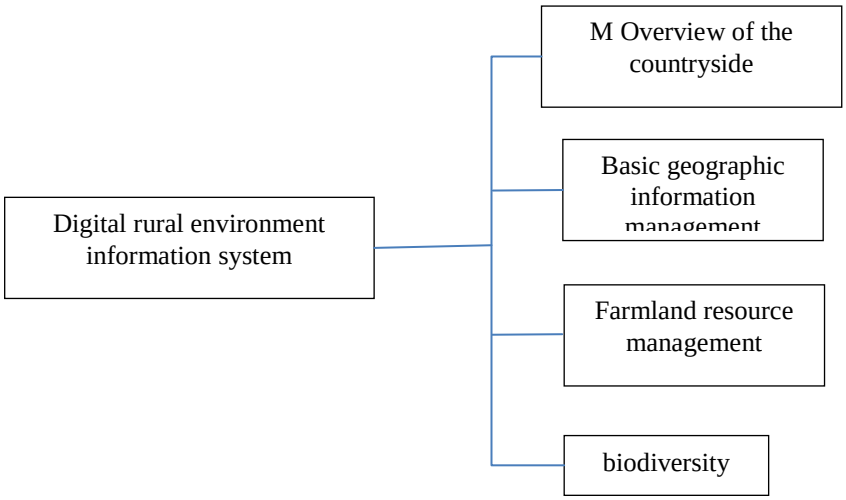

Figure 1. Overall framework of the system

(1) Overview of Village M

This module is mainly to introduce the general situation of rural M. Starting from the profile of rural M, it first briefly introduces the economic origin and ethnic composition of rural M, the administrative villages and natural villages under the jurisdiction of the commune and the basic situation of these villages. This function module is mainly based on the operation of the commune, administrative village and natural village tables in the study area profile database, where some

pictures and short films are stored in the multimedia table.

(2) Basic Geographic Information Management

This module is mainly for the display of geographic information data, you can view the location and basic conditions of the settlements of each natural village, as well as the general image map, water distribution map and road map of the study area. This function is realized by loading administrative boundaries, image data, water system data, road data and natural village basic situation data of the study area.

(3) Agricultural land resource management

Topographic analysis: This function mainly takes the DEM of the study area as the basic data, and analyzes the slope, slope direction and different elevation gradient data of the study area as required.

Land use analysis: The current land use map is used to display the unique values of various use types and classify the area for statistics.

Crop adaptation analysis: Since crops have different habitat requirements, it is necessary to find an environment adapted to crop growth when conducting planning. Among the habitats of crops, altitude information and soil information are considered more often. This module is designed for this function. Firstly, the DEM of the study area is resampled according to different elevation gradients to get the elevation distribution data of different gradients, and secondly, the generated elevation distribution data is cross-analyzed with soil classification data to get data with both elevation and soil information, which mainly includes soil type field and elevation information field. By combining these two fields, a new field with both elevation information and soil type information is obtained. Finally, the analysis results are displayed by the unique value of the new field.

(4) Biodiversity

This module mainly uses the assessment model in the system to evaluate the rural environment and provide decision support for managers.

4.2. Analysis of Rural Environment

The change of land use can be seen in Table 2. The most increased land use landscape unit has construction land with an increase of 12 hectares, while from none to none is aquaculture, followed by rice fields, and miscellaneous land have increased, as shown in Figure 2.

Table 2. Comparison of land use landscape units in 2015 and 2022

Type description	Area in 2022	Area in 2015
Rain-fed and dry-cultivated land	51	62
woodland	45	40
paddy field	32	28
land for construction	18	6
Land use disorder	15	10
wasteland	8	9
aquaculture	2	0

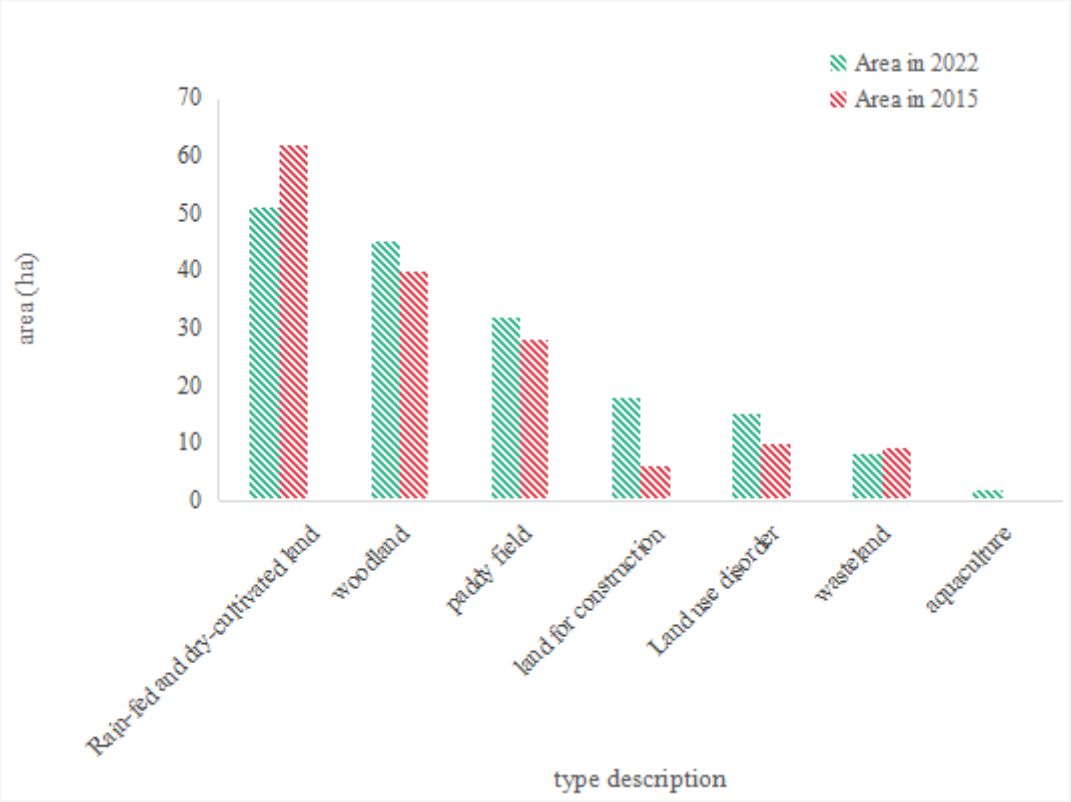

Figure 2. M analysis of rural land use

The change in land cover can be seen in Table 3, where the increasing units are mainly perennial vegetation, hardened ground, and bare soil surface, and the decreasing units are annual vegetation, mixed vegetation, and water surface.

Table 3. Comparison of land cover landscape units in 2015 and 2022

Type description	Area in 2022	Area in 2015
Annual vegetation	68	70
Perennial vegetation	36	25
Mixed vegetation	31	36
Hardened ground	13	5
water surface	12	18
Bare soil surface	6	1
Rock ground	3	1

5. Conclusion

"The country is prosperous when the country is prosperous. It is an important part of the strategic planning of rural revitalization to consolidate the foundation of rural information and implement digital rural construction. This paper takes environmental justice as an entry point not only to enrich the appropriate methods of resource development and utilization and protection in rural ecological planning, and seek justice between people and the environment; but also to fill in the relevant strategies on how to enjoy environmental resources equally and how to bear environmental risks fairly for relevant interest subjects in rural ecological planning, and seek justice between people and the earth, which has a lot of space for exploration. The construction of ecological planning

strategies for environmental justice in rural areas involves a lot of planning and management knowledge, and since I lack practical experience in related management, my research mostly stays at the theoretical level. I hope to do more in-depth research on the operability and timeliness of planning strategies in my future work.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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