

LETTER TO THE EDITOR

Design of Automatic Assess Model for Environmental Coordination of Green Ecological Building Materials

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Aiming at the problem that the traditional assessment model of environmental and material coordination has a large error, an automatic assessment model of environmental coordination of green ecological building materials based on grid is proposed. Firstly, rasterize the data, then normalize or standardize the raster data, and build the spatial database; This paper systematically analyzes the index system of building materials and environmental coordination evaluation, establishes an evaluation model by using analytic hierarchy process, and evaluates the environmental coordination of green ecological building materials. The results show that the automatic assessment model of environmental coordination of green ecological building materials based on grid can accurately evaluate the environmental coordination of green ecological building materials.

Green ecological building; material; environment; coordination; assess

1 Introduction

As the cornerstone of human civilization, material has greatly promoted the development of human civilization. However, from the perspective of resources, energy and environment, the process of material extraction, preparation, production, use, regeneration and waste. In fact, it is a process of resource consumption, energy consumption and environmental pollution. With the development of science and technology, new materials with high quality and high performance appear constantly. Due to the one-sided pursuit of quality and performance, along with the extraction, preparation, production, manufacturing, use and waste process of materials, it consumes a lot of resources and energy, and emits a lot of waste gas, waste water and waste residue. Various statistical data show that the manufacturing, use and waste processes of materials and products are the main causes of energy shortage, excessive consumption and exhaustion of resources and environmental pollution. This raises new issues concerning materials, and it is necessary to take resources, energy and environmental issues seriously, develop ecological and environmental materials, and promote their environmental coordination.

Green ecological building is the product of the development of ecological concept. Green ecological building design is to use the ecological thought, according to the people-oriented design theory, starting from the overall environment composed by people, architecture and nature, to design the building that can realize the harmonious and unified optimal relationship among people, architecture and nature. Make the building and environment become an organic combination. It is not only to create a comfortable small space environment for people, but also to protect the surrounding environment ecological architecture is the historical high level of the return to nature. It

depends on the latest developments in many related technologies and the best match for the technology according to specific conditions. Therefore, the evaluation of the coordination between green ecological buildings and materials has become a hot issue in this field.

Rui Wang published an article in Ekoloji Issue 107, 2019. The title is: “Livability Design of Residential Building Environment Space”. In view of the low accuracy in selecting the optimal path, the low accuracy in planning the building area and the low satisfaction with the design environment space, this paper proposed the design method for the livability of the residential building environment space. The road network and floor connection of each floor were regarded as independent structures. According to the floor distribution of parking spots, the structural network model was adopted to analyze the path through the floors, and the optimal path of all parking spots in the multi-storey building space was obtained. On the basis of the architectural hierarchy, the basic planning area, common area and single building area were calculated. Interior design of residential buildings through spatial form, lighting and color. Inspired by the reading of this article, a study on the coordination between green ecological buildings and the environment was carried out.

Zhou proposed a model for environmental compatibility assessment of steel material production process. Accorded to the actual situation of iron and steel production process, the objectives, boundary conditions, index system of environmental coordination evaluation of steel production process and the framework of cataloguing investigation and analysis were put forward, and the mathematical model of evaluation index system was established. Based on the analysis of steel production process, the framework model of process and resource consumption, energy consumption and waste discharge was established. Through data collection and processing of several technological processes, the results of environmental load cataloging analysis were obtained. Accorded to the environmental load accumulation comparison model proposed, the comprehensive environmental load index of products of different processes and processes was calculated, and the conclusion of environmental compatibility assessment was further explained. However, although this model had high evaluation efficiency, it had the problem of large evaluation error. Zhang proposed a lca-based environmental compatibility assessment model for steel materials. Comprehensively evaluated the environmental load of steel production with the support of LCA assessment software, collected and continuously accumulate basic data of environmental load of steel production (energy consumption, resource consumption, pollutant emission). The corresponding database was established, and the database management software was developed for unified management of the data and further analysis and processing on this basis. (Hsueh and Su, 2017)However, this model has the defects of large error. In order to solve the problem that the traditional assessment model of environmental and material coordination has a large error in assessment, an automatic assessment model of environmental coordination of green ecological building materials based on grid was proposed.

2 Idea Description

2.1 Standardized processing of ecological building materials data

In the assessment of the coordination between ecological building materials and the environment, there are many levels of data. Data sources are different, and data types are not only different (material properties, composition, chemical properties and physical properties, etc.). Even if it's all data, the parameters are not necessarily the same (Digani et al.2018). The establishment of standardized standard database is necessary for the development and use of system functions. The main contents of data normalization processing include:

(1) Rasterization of data. There are significant differences in the characteristics of element combinations that affect environmental characteristics, so the coordination assessment should be implemented in each small area. It is necessary to select standard grid according to the accuracy of basic data of green ecological building materials and convert all data into grid data.

(2) Normalization or standardization of raster data. Since there are often differences between data values and dimensions expressing various factors, there is no comparability between data values based on these dimensions. Therefore, all data of green ecological building materials should be normalized or standardized into a uniform dimensionless comparable data. The algorithm is to reclassify the original raster data, such as classifying according to its own range, so as to convert the original dimensionless value into dimensionless level value, and then carry out spatial operation on each data layer after normalization or standardization.

2.2 Establishment of spatial database

The establishment of standardized and detailed spatial database is the basis and guarantee for the establishment and operation of the green ecological building materials environmental coordination automatic assessment system. The spatial database system was developed on the ARC/INFO software platform. The data content includes basic data layers such as performance, composition, chemical and physical properties of green ecological building materials. And the new spatial features and new attribute relations generated by the spatial superposition, extraction, valuation and buffer operation of the above basic data layers, such as the environmental burden caused by energy loss, material consumption and waste discharge, are derived data for direct service evaluation (Yao et al. 2019). According to the material characteristics of green ecological building, the new data layer needed for evaluation should be determined first, and then the spatial operation content and sequence should be determined. In order to reflect the relationship between the small building materials and the environment in the assessment results, a 10cm×10cm grid is adopted.

2.3 Automatic assessment model of the coordination between green ecological building materials and environment

The automatic evaluation model of the coordination between green ecological building materials and the environment adopts the grid data structure, and the grid grid is used as the unit to generate the single element coordination distribution layer at first; Determine the weight of each index to various schemes; The coordination degree of each grid is calculated and the grading threshold is set to obtain the evaluation results of the coordination between green ecological buildings and the environment.

2.3.1 Determination of evaluation index system

The principles of suitability and sensitivity are the general principles for evaluating the harmony between green ecological building materials and environment (Morsali et al. 2016). Since it is difficult to make quantitative prediction for the sensitivity of environment to the construction of construction projects, the coordination between building materials and environment is generally reflected by the reasonable selection and weight determination of the evaluation index system. The index system should analyze the restrictive factors of high sensitivity of this kind of building materials, and estimate the environmental after-effect after the completion of the project, so as to make it systematic. The index system can be comprehensively reflected from three aspects: energy loss, material consumption and environmental burden caused by waste discharge.

2.3.2 Generation of single index coordination degree distribution layer

According to different evaluation plan or goal, according to the requirements of the various evaluation index, the

index data layer using empty asked superposition, extraction, assignment, single index buffer operations coordination degree classification, get a different green ecological building materials and the environment coordination degree of spatial distribution of the data layer, thus it is concluded that the coordination degree of each index score set G_i , Where is the number of elements; k is the number of types of urban construction land. In this study, the coordination degree of each index data layer is an integer value of $0 \sim 4$, representing extremely low, low, medium and high, respectively. The higher the degree of coordination, the more suitable the building materials are.

2.3.3 The determination of index weight value

On the basis of determining the evaluation index system, the mathematical model of coordinated evaluation can be established according to the structural characteristics of the index system. Since the index system is a multi-level hierarchical structure, ahp is an appropriate method to determine the weight of evaluation index. The specific analysis process includes:(1)Establish a hierarchical structure. (2)The pairwise comparison judgment matrix is constructed by using the scale method of $1 \sim 9$.(3)By applying the principal eigenvector method to analyze the comparative judgment matrix, the relative weight of each element under a single criterion can be obtained; (4)Conduct consistency check. If the consistency requirement is satisfied, the combination weight of the elements can be obtained by normalization of the underlying operable elements. Otherwise, the pairwise comparison judgment matrix is reconstructed. Different green ecological building materials have different coordination with the environment, which is reflected in their evaluation index system and the weight of each index is not necessarily the same. Therefore, it is necessary to establish the weight of evaluation indexes according to different types of land, using the analytic hierarchy process, and obtain the weight set W_{ki} , where M is the type of green ecological building. S is the number of evaluation indicators.

2.3.4 The comprehensive coordination degree of grid and its classification

According to the raster data structure, taking the raster as the minimum unit, the weighted spatial superposition of each index coordination degree level on the whole raster was carried out to obtain the comprehensive coordination degree value of the M -th building material on each raster. By selecting appropriate thresholds for grading the comprehensive coordination degree obtained through evaluation, the spatial coordination degree grading map of each type of land can be obtained. The range of comprehensive coordination degree in the evaluation in this paper is $0 \sim 4$, and it is classified as very low, low, medium and high according to $0 \sim 1, 1 \sim 2, 2 \sim 3, 3 \sim 4$.

Based on the above analysis, the automatic assessment model of environmental coordination of green ecological building materials based on grid is completed.

3 Results

An experiment is needed to verify the comprehensive effectiveness of the designed automatic assessment model for environmental coordination of green ecological building materials. The platform is MATLAB simulation software and the operating system is Windows XP. The evaluation error rate test is mainly carried out, and the test results are shown in table 1.

Table 1 evaluation error rate

Number of experiments	Evaluation error rate /%
10	0.05
20	0.04

30	0.02
40	0.06
50	0.04

Analysis of the above figure shows that the designed model evaluates the maximum error rate to 0.06%, and the data fluctuation is relatively stable. It shows that the evaluation error of the designed model is small, and the coordination evaluation of green ecological building materials and environment can be accurately carried out, which is a further extension of Rui Wang research. The reason for the low error of the designed model lies in the normalized or standardized raster data, the construction of spatial database, the analysis of the evaluation index system of the coordination between building materials and environment, the establishment of the evaluation model with the analytic hierarchy process, and the realization of the accurate evaluation of the coordination between green ecological building materials and environment.

4 Conclusion

At present, a variety of green ecological building materials with the title of environmental protection are emerging at home and abroad. However, green and ecological building materials and environment emphasize the concept of a system, which cannot only focus on a certain link in the process of production or use. Therefore, an automatic assessment model of environmental coordination of green ecological building materials based on grid is proposed. The experimental results show that the designed model has a low assessment error. In the new century, human beings face energy, resource crisis and environmental pollution. These problems seriously threaten the survival of humans and living things. They must fully consider the environmental coordination of building materials and widely adopt ecological environment materials.

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