Research Article

Research on Village Planning and Rural Architectural Design Based on Discrete Dynamic Modeling Technology

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With the advent of the era of big data, the combination of science and technology and urban and rural planning has become the focus of many countries. The improvement of village planning and the redesign of rural buildings can promote the rapid development of villages and strengthen rural cohesion. Based on the above situation, this paper proposes a dynamic programming algorithm combined with discrete dynamic modeling technology to improve rural planning. Firstly, the dynamic programming algorithm is used to reconstruct the village layout and optimize the original village model. The dynamic monitoring technology is used to update the dynamic data in real time to provide specific information for the follow-up rural architectural design. Secondly, the dynamic modeling technology is used to build the building model, which can calculate the building location and building angle of the village. In order to further improve village development, we also put forward the concept of green building design. The performance of traditional modeling technology and discrete dynamic modeling technology in the green building design model is compared. The results show that the discrete dynamic modeling technology can improve the overall performance of rural buildings and improve the operation efficiency of the system in the batch design of green buildings. The village layout improved by dynamic planning reduces the specific travel distance of villagers and provides effective help for rural construction and economic development. Compared with traditional modeling technology, dynamic modeling technology has a shorter workflow and less time. Discrete dynamic modeling technology can realize dynamic batch architecture design and has higher applicability than traditional algorithms.

1. Introduction

In response to the call of rural revitalization strategy, many researchers have put forward the concept of village construction based on a dynamic programming algorithm [1]. Facing the ownership of village residents, the corresponding planning should follow the villagers' own wishes for improvement [2]. The completion of village planning is the basis and guarantee for the construction and management of rural areas and is conducive to promoting the construction of a new socialist countryside [3]. At present, there is a lack of overall supervision on village construction and land use in China. With the continuous acceleration of urbanization, many village construction lands have been transformed into other functions [4]. This situation leads to less and less land needed by villagers, reducing land use and improving

quality, which is obviously not suitable for the current environment. Our planning for rural construction is still in the urban perspective, so we need to change our thinking and replan the layout from the specific situation of the countryside [5]. In the process of rural construction, we should also focus on the use of buildings. How to improve the whole life cycle of the building model and reduce pollution is the content that every building designer needs to consider. Therefore, when designing residential buildings or commercial buildings, it is necessary to consider the impact of environmental, economic, and natural factors [6, 7]. Green performance and minimum cost of architectural design have to be ensured.

Dynamic programming algorithm is an important way for the research of village planning and rural architectural design [8]. In order not to destroy the ecological

environment, we need to improve the layout of the whole village in combination with science and technology. Because there are great differences in terrain, land composition, and natural factors in each region, we cannot layout according to population flow in rural design [9, 10]. Targeted design models are needed. With different personnel densities, the change of population flow belongs to dynamic data change, and the traditional modeling technology cannot meet the needs of dynamic change [11]. When building the model, with the continuous production of historical data, it is easy to cause the problem of increasing the error coefficient. Therefore, this paper mainly uses discrete dynamic modeling technology in a big data environment to analyze personnel flow and architectural design data [12]. The advantage of discrete dynamic modeling is that it can obtain accurate data from dynamic information, eliminate data redundancy caused by repeated information, and improve the overall performance of the model [13].

The innovative contributions of this paper include: (1) dynamic modeling technology has a shorter workflow and shorter time than general models; (2) discrete dynamic modeling technology can realize dynamic batch architecture design, which has higher applicability than traditional algorithms; (3) different from the traditional modeling technology, it can process the dynamic building data and calculate the interval distance of the building model according to the change of sunshine data; and (4) the improved village layout through dynamic planning reduces the specific travel distance of villagers and provides effective help for rural construction and economic development.

This paper is mainly divided into three parts. The first part briefly describes the application of dynamic programming algorithms and big data discrete dynamic modeling technology in village planning and architectural design. The development status of dynamic modeling technology in various countries is analyzed. The second part first studies the application of dynamic programming algorithm in village layout and adds dynamic monitoring technology to dynamic data acquisition. The discrete dynamic modeling technology is used to study the batch design of rural buildings. Compare the advantages and disadvantages between traditional modeling technology and dynamic modeling technology. Finally, the discrete dynamic modeling technology is used to design the green building model and optimize the service cycle of the building model. The third part analyzes the results of dynamic programming algorithms in village planning and compares the results of traditional and discrete dynamic modeling algorithms. Finally, the research results of discrete dynamic modeling technology in green building design are analyzed.

2. Related Works

With the rapid development of urbanization, the research on village planning and rural architectural design has become the focus of attention [14, 15]. In order to keep economic development in a balanced state, rural construction and planning have become one of the main tasks. In rural improvement, village planning is undoubtedly a very important part. Village planning should clarify the architecture of architectural design and implement hierarchical management according to the requirements of space management and control [16]. And all levels cooperate with each other to clarify goals and Directions [17]. In order to ensure the rationality of village planning, relevant governments need to implement rural architectural design research based on sustainable theory [18]. Dynamic programming arithmetic and dynamic modeling technology have been widely used in the medical field, military field, and economic field. They also respond to the concept of rural planning and construction in the new era. The dynamic programming algorithm is used to design the village layout, and the use of dynamic modeling technology is conducive to the design of the house model and the analysis of the respective properties of building materials [19].

The idea of deep learning dynamic modeling technology was formed relatively early [20]. With the continuous development and use of the human brain and the continuous upgrading and application of computer technology, it has made a great contribution to the dynamic modeling technology of artificial neural networks. A variety of design models with research value can be created through discrete dynamic models. It plays an important role in model recognition, signal connection, automatic processing, diagnosis network, and so on [21].

The development of discrete dynamic modeling technology is still in the transformation of virtual reality products [22]. With the continuous development and innovation of science and technology, virtual reality (VR) has gradually entered people's vision and been accepted by people. Scientists conduct dynamic modeling of virtual reality products through dynamic modeling technology, study the performance evaluation of virtual sensor models, and establish relevant evaluation systems.

Scientists put forward the effective application of dynamic modeling technology in the VR industry according to dynamic modeling technology and cases [23]. In the application of virtual reality products, discrete models can be used to create a 3D dynamic virtual environment. At the same time, managers can correct the problems in the system in time and solve them by accurate and rapid means.

The development of dynamic modeling technology is also among the best in the world [24]. Many scientists are committed to studying the relationship between dynamic modeling technology and power system. With the continuous innovation and strengthening of the power system, the power system also tends to be complex and personalized. Important technical means in system function improvement, safety, and stability reflect the applicability and effectiveness of dynamic discrete modeling technology [25]. Based on the above situation, this paper proposes a dynamic programming algorithm combined with discrete dynamic modeling technology to study village planning and rural architectural design.

3. Research on Village Planning and Discrete Dynamic Modeling Design of Rural Buildings Based on Dynamic Programming Algorithm

3.1. Research on Discrete Dynamic Modeling Technology and Batch Design of Village Layout and Rural Buildings Based on Dynamic Programming Algorithm. With the continuous development of urbanization, more and more people turn their focus to the development of rural planning and rural architectural design. In the planning of the village construction path and overall residential layout, we use a dynamic programming algorithm to study it. Dynamic programming is the best mathematical algorithm to find the solution strategy, which can optimize the minimum path problem. At present, it is widely used in the fields of economic management, production and processing, mechanical design, and so on. The main contents of the solution also include finding the optimal path, equipment detection, resource allocation, and so on. Assuming that the overall layout of the village is relatively scattered, we need to consider the distance of each household out of the village and into the village. There will be multiple roads from one area to another, but each line takes a different time. Using a dynamic programming algorithm can increase the utilization rate of some land and provide a good environment for subsequent rural architectural design. The principle equation of dynamic programming is as follows:

$$
\begin{aligned}
f_i(S_K) &= \mathrm{opt}\{R_i(S_{K-1} \longrightarrow S_K) + f_{i-1}(S_{K-1})\}, \\
f_i(S_{K-1}) &= \mathrm{opt}\{R_i(S_K \longrightarrow S_{K-1}) + f_{i-1}(S_K)\}.
\end{aligned}
\tag{1}
$$

The above formulas are the forward and reverse calculation results of the planned path, respectively. According to the dynamic equation, the following variable functions can be obtained as follows:

$$
f_2(J_1) = \mathrm{opt}\left\{
\begin{array}{l}
R_2(I_1 J) + f_1(I_1), \\
R_2(I_2 J) + f_1(I_2), \\
R_2(I_3 J) + f_1(I_3).
\end{array}
\right\}.
\tag{2}
$$

In the process of forward calculation, the operation path schemes from one variable function to another variable function are as follows:

$$
f_2(C_1) = \min\left\{
\begin{array}{l}
R_2(B_1 C_1) + f_1(B_1), \\
R_2(B_2 C_1) + f_1(B_2).
\end{array}
\right\}.
\tag{3}
$$

From the second stage, there will be reverse possible results, so we choose reverse calculation. The formula is

$$
f_4(D_1) = \min\left\{
\begin{array}{l}
R_4(E_1 D_1) + f_5(E_1), \\
R_4(E_2 D_1) + f_5(E_2), \\
R_4(E_3 D_1) + f_2(E_3).
\end{array}
\right\}.
\tag{4}
$$

After calculating the best path of village layout, we replan the distribution map of actual rural households, as shown in Figure 1.

It can be seen from Figure 1 that in the distribution of original villages, many architectural designs cannot be
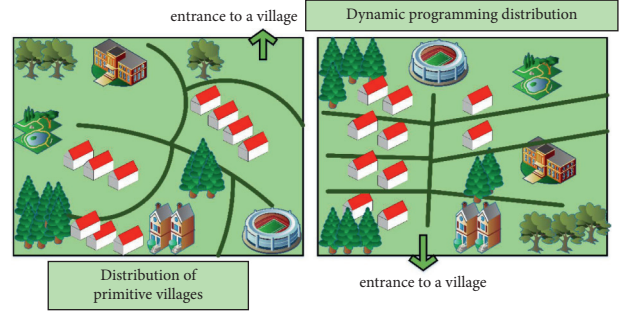

FIGURE 1: Replanning of rural household distribution.

successfully used due to the unreasonable design of the village entrance. The distribution map calculated according to the dynamic programming algorithm can meet the basic requirements of rural architectural design. In order to better monitor the selection of rural architectural design sites, we use the method of dynamic monitoring to collect and classify the data. Due to different geographical environments and equipment resolutions, we need to reduce the terrain scale. Monitoring technology uses satellite remote sensing technology to extract changes in rural images. The whole process of dynamic monitoring is shown in Figure 2.

It can be seen from Figure 2 that the basic data of layout is collected in the early stage, and the planning mathematical model is obtained according to remote sensing data processing. The ownership information of the place of use is obtained by drawing speckle extraction. Therefore, dynamic planning path and dynamic monitoring technology can accurately analyze land use and rural construction layout. It provides a model framework for subsequent architectural design. Before the big data environment, rural architectural design mainly used traditional modeling technology. However, the traditional modeling technology can only create rural buildings through logic and imagination. Such buildings may not be able to withstand the test of the social and natural environment. The traditional modeling technology is only helpful for some specific building models and will produce similarities. The discrete dynamic modeling technology used in this paper can quickly complete the modeling work and can also be modified uniformly in the aspect of model modification, which greatly saves time and energy. The comparison of time spent in the establishment of the same model between traditional modeling technology and dynamic modeling technology is shown in Figure 3.

As can be seen from Figure 3, when the data details exceed 100, the time spent on the project by dynamic modeling technology is much shorter than that by traditional modeling technology. The first mock exam is more complex, and the time taken to build the same model is longer. Compared with traditional modeling technology, dynamic modeling technology has a shorter workflow and less time, as shown in Figure 4.

As can be seen from Figure 4, the workflow comparison between the two is very obvious. Dynamic modeling technology improves the work efficiency of the model by simplifying the steps of data analysis. Due to the dynamic nature
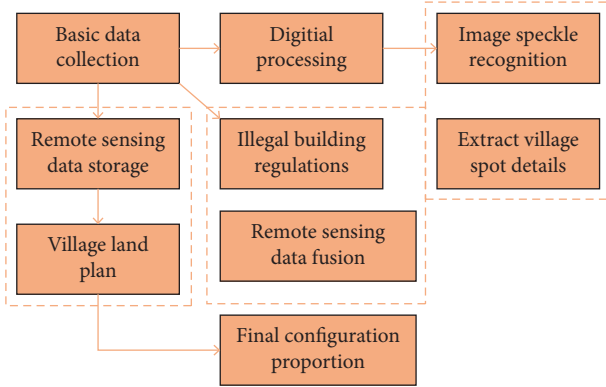
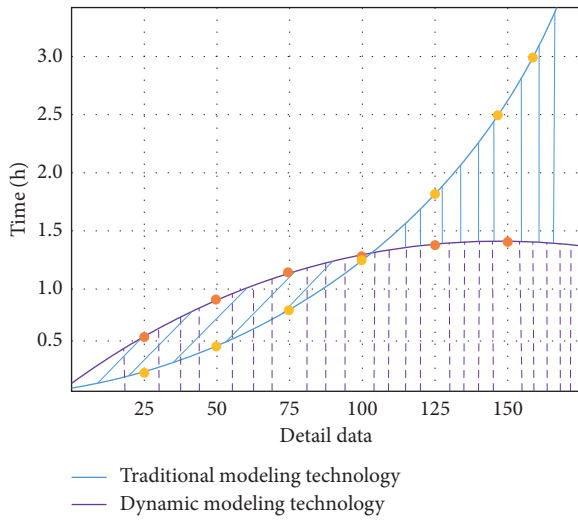Figure 2: Flowchart of dynamic monitoring.

Figure 3: Comparison of time spent by traditional modeling technology and dynamic modeling technology.
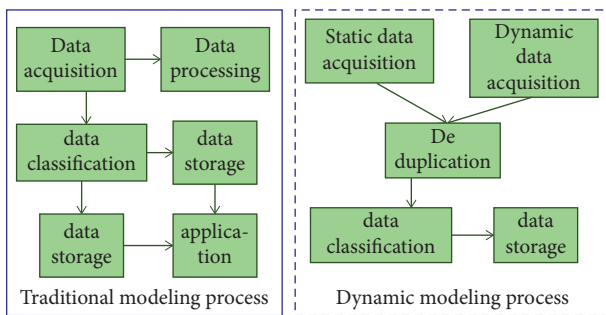

Figure 4: Comparison of workflow between dynamic modeling technology and traditional modeling technology.

of data information, traditional modeling technology cannot simplify this part. Therefore, dynamic modeling technology can quickly describe the rural building model. The discrete dynamic model can calculate the model orientation, bottom shape, model shape, model height, coordinate position, rotation size, model size, and so on. Designers can simply use dynamic modeling technology to create and modify models.

In the discrete dynamic modeling technology, the content of batch buildings is extremely rich, and the distribution is relatively uniform, with a certain level. In many aspects, it can balance distribution and achieve excellent results. For example, in the application of folding beam, when the beam forms a fixed angle with the ground as the maximum value, there is

$$\sin \beta \le \frac{H - h}{l_{10}}, \quad l_{10} > 0. \tag{5}$$

In order to obtain the fixed included angle of each wood strip relative to the ground on a straight line, the formed straight line is expressed as a vector as follows:

$$e_i = \frac{P_i Q_i}{\| P_i Q_i \|}. \tag{6}$$

We express the vector obtained by the above formula in geometric relation as follows:

$$\cos \beta_i = e_i \cdot e_y. \tag{7}$$

Finally, it can be seen that the angular relationship between the beam and the ground is as follows:

$$\beta_i = \arccos \left(\frac{P_i Q_i}{\| P_i Q_i \|} \cdot e_y \right). \tag{8}$$

The dynamic process of building details can be known through the angle β_i between the wood strip and the ground. In the discrete dynamic modeling of rural architectural design, we map the angle between each building and the ground for dynamic distribution. Finally, the purpose of a batch design can be achieved.

3.2. Research on Simulation Design of Green Rural Buildings Based on Discrete Dynamic Modeling Technology. Due to the national regulation of the space system, village construction land and housing construction have ushered in a new development situation. However, land resources are limited. How to correctly use village resources and construction land is the key content to ensure the development of rural construction. The construction purpose of saving needs to be reflected to achieve the integration of ecology, beauty, and applicability. In the design and planning of rural buildings, it is necessary to determine the rationality of specific land use and eliminate differential allocation. According to the infrastructure, geographical environment, and population development of the village, the architectural design distribution is carried out from many aspects. We should not only pay attention to the current rural development but also evaluate the future potential. As the change of villages will be affected by nature and the economy, we need to establish green rural buildings to protect the natural environment while developing villages. The core content of green building is low-carbon environmental protection. It is necessary to optimize the building model and concept in architectural design to realize environmental protection design. Under the theme of green environmental protection in rural

architectural design, this paper uses discrete dynamic modeling technology to form the evaluation model of green building materials. The characteristic analysis of energy, carbon emission, and other indicators is carried out.

In the green building design model, we analyze the stability of the parameters according to each performance index. The influencing factors include light, temperature, and so on. The weight values of these independent variables are as follows:

$$K = \left[K_1^T K_2^T K_3^T K_4^T K_5^T \right]^T I = \left[I_1^L I_2^L I_3^L I_4^L I_5^L \right]^L. \tag{9}$$

The above two variables form an evaluation quantitative matrix to realize the grade evaluation of green rural buildings, which needs to meet the following conditions:

$$r_{x,y}(n) = \begin{cases} \widehat{r}_{x,y}(n+L) - (M-1) \le n \le -1, \\ \widehat{r}_{x,y}(n)0 \le n \le N-1, \end{cases}$$
$$\widehat{f}_t(n) = \begin{cases} f(n)n = 0,1,2,\ldots,M-1, \\ 0, n = N, N+1, \ldots, L-1, \end{cases} \tag{10}$$

where $r_{x,y}(n)$ represents the edge factor of the building structure, $\widehat{f}_t(n)$ represents the absorption rate of carbon change, and the following formula is obtained:

$$Q_{CO_2} = W_{CO_2} \cdot \text{ILAI},$$
$$Q_{O_2} = W_{O_2} \cdot \text{ILAI}. \tag{11}$$

where Q is the carbon emission after the optimal design of green buildings and Q_{CO_2} is the carbon emission in the design of rural buildings. Finally, we need to evaluate the environmental protection of the architectural design model, use the light intensity and fuzzy function to express the overall purification amount, and use the assimilated calculation formula for hierarchical fusion. The final set of evaluation formulas for rural green buildings is as follows:

$$\psi_{11} = \text{PA} + A^T P + Q_1 + R_1 + R_2 + K_1 + K_1^T,$$
$$\psi_{12} = W_1 - K_1 + M_1 + K_2^T. \tag{12}$$

In the process of designing rural green buildings, how to improve the service cycle of buildings, change the utilization rate of models, and reduce resource consumption is an urgent problem to be solved. Generally speaking, we should not only reduce the timber but also improve the building service life, and improving the service life mainly depends on the design, development, and packaging in the early and later stages and more investment. Therefore, in the daily work of design projects, the control of quick setting cost and management cost is the key to the precision and benefit of design work. The key to cost control is the utilization rate of high investment construction resources, which needs to go through the whole process of project implementation. Improving the utilization rate of construction resources, high work efficiency, and management level are areas that need continuous reform and innovation. We analyze the changes of traditional building and green building models from two aspects: sunlight oxidation and rainwater erosion, as shown in Figure 5.

It can be seen from Figure 5 that the service life of the traditional building structure model is gradually shortened with the increase of oxidation rate. At the initial stage of oxidation, the adaptability of green buildings to oxidation is less than that of traditional buildings. With the gradual increase of oxidation degree, the oxidation tolerance of traditional buildings has been gradually worse than that of green buildings. This shows that the green environment has the ability to fully adapt to the natural environment, which can also be called sustainable development building. The building model with a green design can ensure that the overall cycle is above the standard range. In rural architectural design, we need discrete dynamic modeling and analysis of pavement permeability. In order to ensure the beauty and stability of the building, this paper uses a permeable ground design to improve the building ground. The traditional modeling technology intelligently analyzes the factors that the water permeability will affect the growth of ground plants. Discrete dynamic modeling technology can detect the change speed and durability of water permeability. Due to the need for a green environment, we can also combine a sunken green design on the original road surface. The optimized building ground design is shown in Figure 6.

It can be seen from Figure 6 that the optimized green building ground can ensure the normal growth of vegetation and solve the problem of soil loss in rain. Therefore, this technology can be applied to the transformation and matching of gardens in rural architectural design. Finally, we analyze the accuracy of the green environmental protection evaluation coefficient in building model construction by traditional modeling technology and discrete dynamic modeling technology, as shown in Figure 7.

It can be seen from Figure 7 that discrete dynamic modeling technology can automatically analyze dynamic data changes in model construction and has a high grasp of model accuracy. Compared with traditional modeling technology, it has greater advantages and can provide more accurate data in green rural architectural design.

4. Analysis of Research Results of Village Planning and Discrete Dynamic Modeling Design of Rural Buildings Based on Dynamic Programming Algorithm

4.1. Analysis of Results of Batch Design of Rural Buildings Based on Discrete Dynamic Modeling Technology. Due to the dynamic change of rural planning according to the actual geographical location and facing the dynamic data, this paper uses discrete dynamic modeling for building batch design and data collection. According to the improvement of layout simulation and miscellaneous data, a new target batch construction model is created, and the final building model is generated. The update and optimization of the whole system can continuously innovate and improve efficiency with the increase of dynamic data. Since the illumination distribution changes dynamically with time, we need to consider whether the illumination rate of each house meets the requirements in architectural design. Therefore, we need
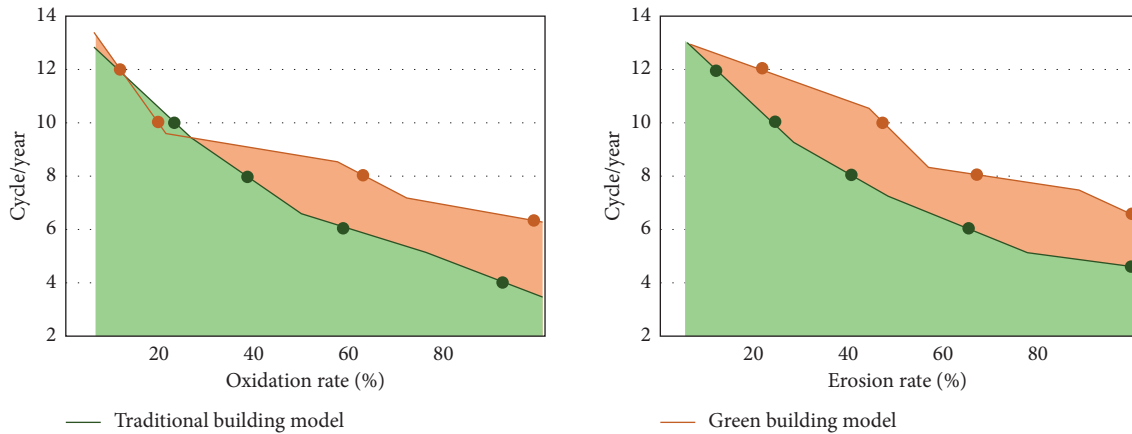
Figure 5: Changes of traditional building and green building models in oxidation rate and erosion rate.
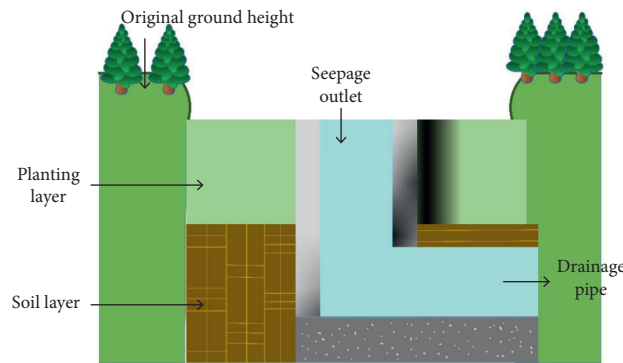

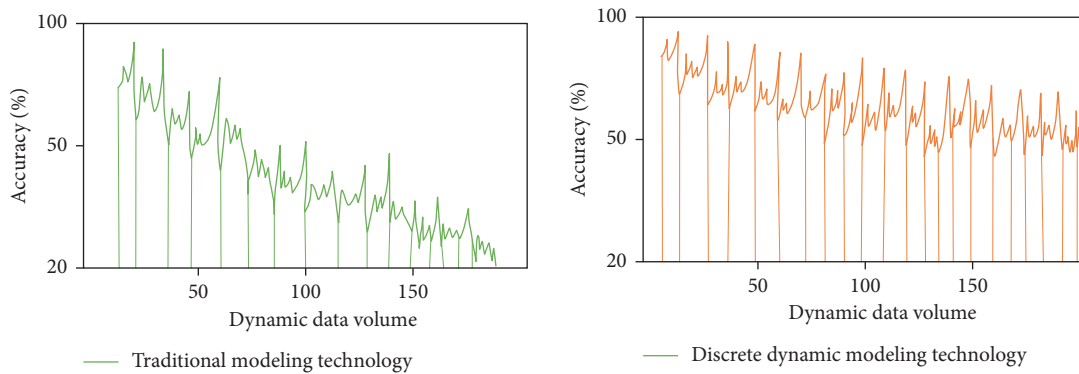Figure 6: Optimized building ground design drawing.

Figure 7: Comparison results of accuracy between the two in green environmental protection evaluation coefficient.

to use dynamic modeling technology to simulate and analyze the illumination threshold. As time changes, the illumination threshold range also changes, as shown in Figure 8.

As can be seen from Figure 8, compared with traditional modeling buildings, discrete dynamic modeling house design can raise the illumination range to the maximum threshold, so it is effective for the environmental optimization of the whole household. Finally, we analyze the efficiency of traditional dynamic modeling technology and dynamic modeling technology in building design batch model construction, as shown in Figure 9.

As can be seen from Figure 9, compared with traditional modeling technology, dynamic modeling technology has higher efficiency with the continuous increase of modeling data. Under the constraints of any model structure data, dynamic modeling technology can complete the task of batch architectural design models. It can be seen that the design system using dynamic programming and discrete dynamic modeling can ensure that the number of architectural design is in an advantageous state. According to the dynamic building model, users can choose the house they need under clear lighting conditions. Users only need to
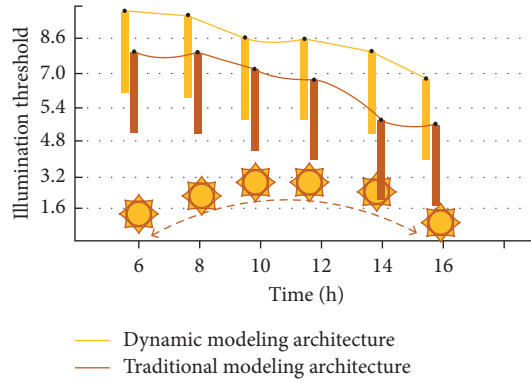
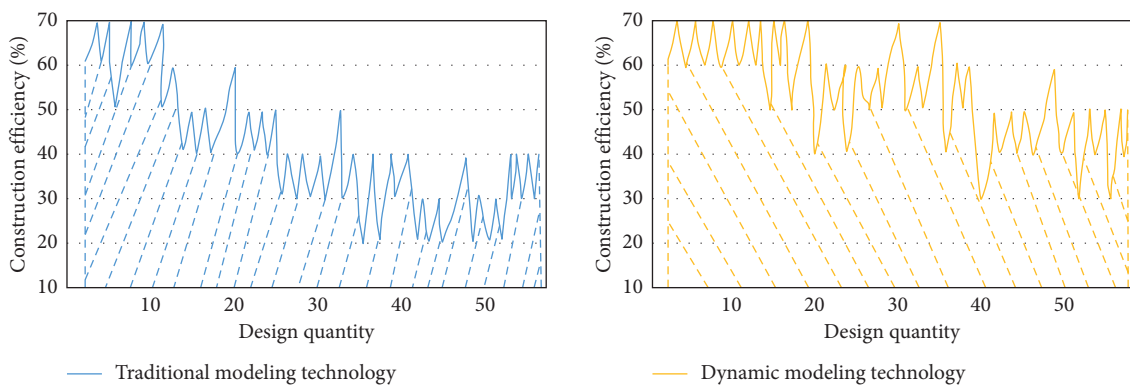FIGURE 8: Change diagram of illumination threshold data.

FIGURE 9: Efficiency comparison between traditional dynamic modeling technology and dynamic modeling technology in batch model construction of the architectural design.

enter the house keywords they are looking for in the model search interface, and they can obtain the specific data information that meets the personalized needs. For village planning, the use of this model can also meet the preferences and needs of villagers to the greatest extent and make choices under reasonable conditions. It not only meets the government's task of rural construction but also meets the personal needs of the local people.

4.2. Analysis of Research Results of Green Rural Building Simulation Design Based on Discrete Dynamic Modeling Technology. In rural planning and architectural design, in order to improve the overall living environment of villagers, we need to provide residents with comfortable living spaces and a green living environment. It is conducive to people's physical and mental health and the rise of living standards. In order to achieve this goal, the ultimate goal is to ensure that the village planning has a good field of vision, a quiet living environment, and an appropriate sunshine duration. When designing green building materials, this paper uses discrete dynamic modeling technology to build the model. It mainly analyzes the overall service cycle of the building structure and the utilization degree of resources. In order to reduce unnecessary construction waste, we also need to consider the actual needs of villagers. Therefore, this paper studies permeable asphalt ground buildings and

sunken green vegetation buildings. It can optimize the landscape effect in architectural design and use green vegetation to improve the quality of life. In the dynamic modeling, the residential model needs to consider the problems of lighting and shading. Especially in seasonal and weather changes, indoor space needs enough light. In discrete modeling, the overall layout needs to be considered, and the distance between each building will affect the change of illuminance.

In the use of energy-saving and environmental protection substances, we compare the substance detection results of traditional modeling technology and discrete dynamic modeling technology, as shown in Figure 10.

As can be seen from Figure 10, with the increase of the number of materials, the traditional modeling technology cannot accurately analyze the pollution coefficient of each building material. The discrete dynamic modeling technology used in this paper can form a tracking curve according to the material dynamic pollution data. Therefore, in green building design, the discrete dynamic model not only can reduce environmental pollution but also can analyze the performance of building materials. The application of green building design concepts in different environments will continue to rise. With the progress of people's thinking, innovative schemes using green design will continue to increase in village planning and rural construction.
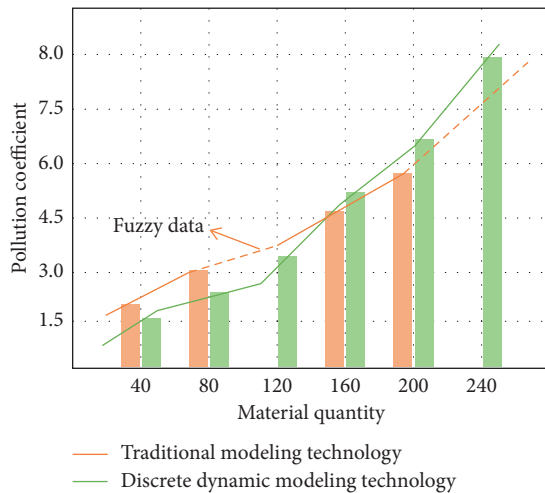
FIGURE 10: Pollution coefficient results of traditional modeling technology and discrete dynamic modeling technology for material detection.

5. Conclusion

With the continuous development of science and technology, in urban and rural construction, more and more people begin to pay attention to the research of rural planning and rural architectural design. In architectural design, the concept of green design is also expanding. In addition to the land planning for environmental protection, the range of pollution coefficient shall be strictly controlled in the use of materials. Based on the above situation, this paper proposes to use a dynamic programming algorithm to optimize the village layout and use discrete dynamic modeling technology to optimize the architectural design model under the background of big data so as to improve the overall performance of the model. Using the dynamic programming algorithm, combined with the actual situation of the village, the distribution of land use rate is analyzed to form an intelligent village layout optimization structure. This structure improves the daily travel of villagers and plays an important role in economic development. Dynamic monitoring technology is used to obtain village change and sunshine data so as to provide dynamic data for the establishment of subsequent rural construction models. Different from the traditional modeling technology, it can process the dynamic building data and calculate the interval distance of the building model according to the change of sunshine data. It is ensured that users in each village can get comfortable living conditions. This paper analyzes the concept of green building design, analyzes the main factors of environmental pollution, and reduces the incorrect use of building materials. The results show that the dynamic programming algorithm can improve the living environment of villagers and provide convenient conditions for economic development. Discrete dynamic modeling technology can realize dynamic batch architecture design and has higher applicability than traditional algorithms. However, there is still the problem of simulation data simulation in this paper, which makes the complex conditions in the actual situation not considered in the architectural design. Further discussion is needed in future research.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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