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Construction of Interior Design Teaching Resource Based on Intelligent Matching Model

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Abstract. Currently, there are problems in interior design teaching, such as relatively scarce teaching resources, low utilization of teaching resources, and poor learning outcomes. The interior design teaching resource library based on CAD systems is an important way to solve these problems. The study focused on analyzing and constructing the design of CAD indoor teaching resources. Firstly, the construction principles, content, and application advantages of this resource library are analyzed. Then, a case-based system design method is adopted to design it. Finally, visualization technology is used to conduct application experiments in interior design teaching, verifying that the interior design teaching resource library based on CAD systems has good application effects. The research results conducted a professional application affect demand analysis for interior design students. Evaluating different visual designs meets the needs of teachers in building resource libraries and providing support for future teaching classrooms.

Keywords: CAD System; Interior Design; Teaching Resource Library; Intelligent Matching Model; Visual Teaching
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1 INTRODUCTION

Interior design teaching is a compulsory course for students majoring in architectural design, interior design, and other related majors. This course is a comprehensive discipline that integrates theoretical knowledge, skill operation, and artistic creativity. It has high requirements for students' aesthetic ability, design thinking, and spatial imagination. Due to the problems of limited course hours, relatively scarce teaching resources, and dull teaching content in interior design teaching, students feel overwhelmed during the learning process, which is not conducive to further in-depth learning. Therefore, building an interior design teaching resource library based on CAD systems, providing students with rich and diverse teaching resources, and solving problems in teaching, have become an important way to improve the quality of interior design teaching and promote student learning effectiveness.

The design of a passive building operation and maintenance management visualization platform is essential. At present, most building visualization operation and maintenance platforms only display two-dimensional scenes, which cannot intuitively and clearly display information such as the three-dimensional structure, equipment, and pipeline layout of buildings. Some building 3D visualization platforms adopt a C/S architecture, which has problems such as poor scalability, high-security risks, and high costs, and can no longer meet the needs of modern customers. Berseth et al. [1] conducted customized spatial optimization on iterative building layouts. Designed and built a passive 3D visualization platform for buildings. In this work, by improving the visibility, accessibility, and information acquisition of the proposed navigation space, the construction environment is optimized using architectural indicators. Douglas et al. [2] achieved the explicit and implicit function of model components through their research on CAD visualization technology and established the association between equipment data and components. Display models with different levels of precision according to different situations, and achieve rendering and loading of passive building models on the web page. By introducing light sources and camera objects, complete the shading and rendering of model data in the Scene scene object. Simplify the model using a triangular mesh simplification algorithm to generate models with different levels of precision. These functions can provide support for the operation of passive building 3D visualization platforms, helping managers to more accurately understand the structure and equipment information of buildings, and thus more efficiently carry out operation and maintenance management work.

However, in current 3D visualization systems, most systems remain in the C/S architecture mode. In the visualization process, it is necessary to enhance the sense of interaction to improve the user experience. Fan et al. [3] downloaded the mobile client PC and connected it to the database in order to achieve a three-dimensional visualization effect. The current demand for 3D visualization is increasing, which makes the requirements for 3D visualization technology more comprehensive. Providing strong technical support for industry upgrading and replacement, visualization or alarm systems is indispensable in the operation and maintenance management process of passive energy-saving buildings. Han et al. [4] developed a model concentration format based on a three-dimensional framework. Through the analysis and transformation of morphological visualization, the key performance concentration of the model was constructed. In different visual architectures, virtual staircase files were used for indoor structure visualization transformation in virtual reality. This helps designers effectively apply the model. Iranmanesh and Onur [5] conducted a virtual design analysis on the different learning perspectives of architecture students and optimized their software participation in interior design. It points out that the production of components in a single building's interior design cannot be separated from the revolutionary strategy of digital technology. From preliminary design sketches to analysis of individual building components, it significantly enhances digital visual design.

Traditional interior design methods have significant drawbacks as they struggle to establish building generation logic on platforms. It cannot effectively simulate the construction process of buildings while providing accurate information for construction. Ko [6] analyzed the parametric constraints and additive constructions of three-dimensional interior design. As an important development direction of computer-aided design, parametric design can achieve a high degree of unity between the design process and engineering control. The development of CAD technology and the demand for customized interior design products are the results of two parallel factors driving the development of parametric design. Meanwhile, this production model also meets customer requirements. Business requirements have led to rapid technological development. The industrial chain of computer design and manufacturing is developing under the penetration of this business environment. The constantly evolving technology ensures the uniformity of interior design style. And it can effectively play its role in various processes of the production cycle. CAD intelligent algorithms are the essence of building construction generation in stylized interior design. The inherent logic behind the generation of architectural interior design stylization is through algorithmic operations in specific directions, ultimately generating a specific form of building. Roman et al. [7] conducted an information-based analysis of building objects in a data environment for solving 5D indoor structural design in digital architecture. It sets the mechanism for indoor elements by constructing links to the intelligent platform. It involves algorithms for designing various architectural styles, including designs related to logic and geometric shapes. In the process of digital architectural style design, certain geometric spatial constructions can be generated through computer programs based on certain input conditions to form shapes with specific logic.

The numerous casualties that have occurred inside buildings are heartbreaking. In order to reduce the frequency of such tragedies, we need to actively incorporate fire safety measures in the interior design stage, optimize the safe evacuation path of residents, and improve survival rates in emergency situations. Sabbaghzadeh et al. [8] have developed a comprehensive framework aimed at developing an efficient and economical fire safety plan, while also considering the safety evacuation efficiency of residents and the project budget. This framework is divided into four key stages: first, preliminary preparation work is carried out, including a detailed understanding of the internal structure of the building, assessment of potential safety risks, and the development of preliminary safety evacuation strategies. Next, it utilizes advanced metaheuristic algorithms for optimization to find the optimal security design path. Subsequently, the designer will select the most suitable fire safety measures based on the optimization plan provided by the algorithm, within budget constraints. Shivegowda et al. [9] used CAD software to carry out precise interior fractal construction design of building information models. By accurately introducing technical documents, a broader range of interior design creation efficiency has been implemented. Fractals have long been subconsciously reflected in architecture as a cultural structure. In parametric architectural design, architects can easily edit fractal logic into fractal iterative algorithms. The logical loops of fractals and algorithms are basically isomorphic. The rectangular corridor of traditional architecture is nested with a single skeleton rectangular plane, and its spatial composition pattern reflects self-similarity. In classical architecture, the repetition of design motifs reflects the fundamental form of fractals. Designers can use CAD software to create three-dimensional indoor space models and simulate realistic design effects by adjusting parameters such as size, scale, and material. This visual design approach not only helps designers better grasp the overall effect of the design but also enables more intuitive communication with owners or clients, ensuring the accuracy and satisfaction of the design scheme. This approach not only ensures that the implementation of interior design is consistent with the original intention of the design, but also improves construction efficiency and quality, reducing manual errors.

At present, there have been many research results on the construction of interior design teaching resource libraries based on CAD systems [4]. Specifically in the field of interior design teaching, relevant research mainly focuses on the construction of interior design teaching resource libraries based on CAD systems, visual teaching strategies, and effectiveness evaluation. There is relatively little research on the construction of interior design teaching resource libraries based on CAD systems and visual teaching strategies. Therefore, this study takes the construction of an interior design teaching resource library based on CAD systems as the research object and combines visual teaching theory and psychological theory to explore its application in interior design teaching.

2 RELATED WORKS

Interior frame designers are particularly reluctant to digitize and do not want to use automatic generation software. Stojanovski et al. [10] proposed the application of digital software intelligent algorithms for regression style design in interior decoration. It analyzed the "facades" of different buildings and visualized the interfaces directly in contact with the external space. In some cases, especially when the building's enclosure structure is integrated with the roof, this makes it difficult to distinguish between the building's facade and the roof. The exterior enclosure structure and building facade are integrated together, and the building facade cannot be separated from the building structure. The building structure forms a part of the building facade. In its research, digital intelligent simulation was used to solve this problem. Digital visualization usually does not distinguish between building envelope structures and building roofs. Both the building envelope structure and the building roof are generally recognized as building facades. Interior designers use a toolbox composed of customized design elements and symbol systems to work in a complex design world. The design world is composed of elements, rules, and patterns, which serve as the preservation environment for its unique graphic design knowledge.

Visualization technology can be successfully solved in interior design using the latest 3D modelling tools. Tytarenko et al. [11] developed a method for utilizing historical artifacts with sufficient accuracy in architectural environment interior design. The modelling process includes monitoring the territory of the object, analyzing archives, librarians, and mapping sources. And use various software tools to further model and replicate research objects in a virtual environment. It uses AutoCAD and SketchUp to design working 3D models. Using visualization technology to add more interactive features to the teaching resource library. For example, hotspots and annotations can be added to 3D models to facilitate learners in understanding the details and features of the design. This study can also set roaming paths and perspective switching, allowing learners to freely explore the spatial layout inside and outside the building. The stylistic treatment methods for indoor wall surfaces in buildings are diverse and complex, with different forms, which gives rise to the various classification methods mentioned above. Under different classification principles, the classification of indoor walls in buildings has different results. Resulting in low efficiency. To address this issue, Wu and Tang [12] have developed a BIM-assisted workflow to improve the efficiency of preliminary building design. It creates a workflow, obtains duration data through questionnaires, and verifies it through actual simulations. Combined with interior design, the application of this framework will be more extensive and in-depth. Designers can consider fire safety measures when planning indoor layouts, such as setting up reasonable evacuation routes, configuring necessary fire equipment, optimizing lighting and indication systems, etc.

Wu et al. [13] optimized and developed a stylized room layout for interior boundary tile design. It scans the visual style graphics of the room in 3D and quickly generates 2D sections that can be cut freely, making it easy to display the internal structure of the building. Quickly model through digital visualization graphics stretching and other operations, providing a large amount of materials such as texture maps and component primitives. The model can provide model support for the overall construction of the room during generation. However the modeling accuracy is not high, the model details are described less, and the drawing quality is average. The constructed model does not contain attribute information and can only be used for visual display. Wu et al. [14] conducted an advanced algorithmic symmetry analysis of architectural style reflection. It chooses Revit software to draw building models and integrate and convert data with GIS platforms. The building model constructed by Revit contains rich geometric and attribute information semantics. There are greater advantages in modelling efficiency, collaboration, analytical decision-making, and asset management. It solves the problem that traditional building 3D modelling software only has basic information queries and simple spatial analysis, and buildings do not have detailed attribute information.

The variation range of stylized artificial optimization in interior design is extremely limited, while the variation of formal parameters is jumping and discontinuous. Therefore, Xiao and Bhola [15] designed an ecological correlation and rapid feedback mechanism for collaborative interior design in architecture. Traditional interior design methods cannot achieve exhaustive optimization results. It is difficult to achieve a state that approximates the optimized design style due to the problem that only better can be achieved. Therefore, although there are quantitative simulation results compared as evaluation criteria for formal optimization, the direction and methods of formal optimization are more influenced by individual subjective judgments. In its "architecture interior" style design method, the adjustment of architectural form is achieved through intelligent algorithms to modify geometric models, resulting in high accuracy. Yi [16] conducted a geometric spatial analysis of architectural interior design style using visual programming. It has designed navigation for indoor coordinate systems based on a visual platform engineering information model. By making changes to 3D architectural and geographic models, and updating linked attribute tables, dynamic and real-time asset management can be achieved. It fully demonstrates the powerful visualization ability of digital intelligence technology. It is based on precise 3D models for scientific interior design coordination and assists in solving practical problems for multiple specialties. Provided decision support and expanded the application field of integrated technology.

3 PRINCIPLES FOR CONSTRUCTING AN INTERIOR DESIGN

3.1 Construction Principles and Overall Architecture

The interior design teaching resource library based on the CAD system is a comprehensive teaching resource system that integrates the development, teaching practice, and student learning needs of the interior design industry. It is composed of multiple modules. Under this system, the CAD system is used as the carrier and interior design teaching content is relied on to integrate theoretical knowledge, practical teaching, and learning outcomes of interior design-related majors, achieve the integration and application of multidisciplinary and multi-professional knowledge, and achieve breakthroughs in various aspects. Therefore, in the process of building the interior design teaching resource library in this study, adjustments will be made based on student needs and teaching content to enrich the content of the resource library and achieve visual teaching. The overall architecture is shown in Figure 1.

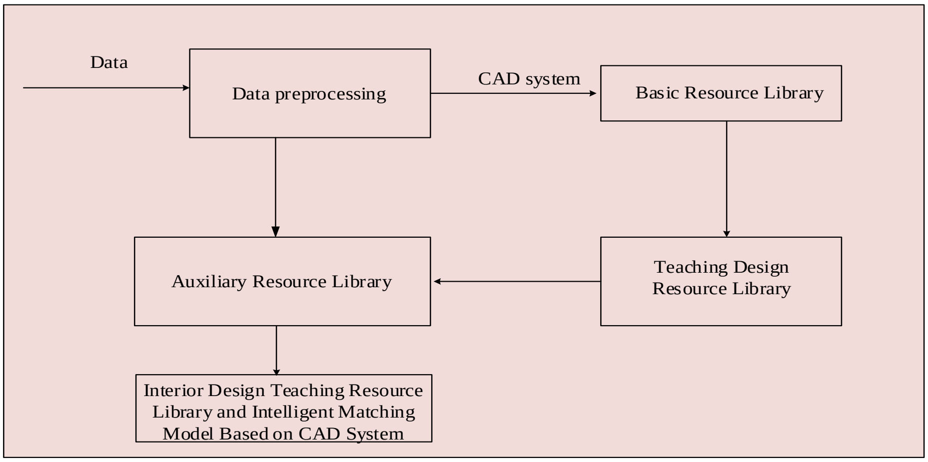

Figure 1: The overall architecture of the interior design teaching resource library and intelligent matching model based on the CAD system.

From the perspective of the entire resource library construction, it mainly includes three modules: basic resource library, instructional design resource library, and auxiliary resource library. The basic resource library mainly includes CAD software, related equipment, teaching cases, teaching design schemes, etc. The teaching design resource library mainly refers to the case-based and video-based design carried out by teachers based on specific teaching content on the basis of the basic resource library. This part is not only an important way for students to consolidate theoretical knowledge but also an important way for teachers to impart knowledge and skill training to students. The auxiliary resource library mainly refers to teachers transforming knowledge points into specific teaching cases through case-based design, video design, and other methods during the teaching process, thereby deepening students' understanding and memory of theoretical knowledge and improving their learning interest. For the teaching design resource library, teachers need to select suitable CAD software and related equipment based on teaching content and objectives. For example, in the teaching process of interior design, teachers need to analyze the teaching content and select CAD software based on actual situations. Teachers need to design relevant cases based on actual situations during the teaching process. For example, during the learning process of interior design courses, teachers can choose specific cases such as interior design projects for teaching; Teachers also need to explain knowledge points through case-based design and video design during the teaching process. For example, when studying interior design courses, teachers can choose specific cases such as interior design projects to explain; Finally, teachers also need to guide and interact with students based on classroom content.

Therefore, the interior design teaching resource library based on the CAD system is composed of three core parts, with the CAD system as the carrier and interior design professional courses as the basis. The basic resource library includes hardware foundations such as CAD system software and related equipment, which need to be matched with hardware equipment; The teaching design resource library mainly refers to the case-based design and video-based design that teachers carry out for specific content and knowledge points during the teaching process, and is an important tool for achieving visual teaching; The auxiliary resource library mainly refers to assisting teachers in providing visual guidance, interactive communication, etc. to students.

3.2 Building Intelligent Matching Model

In order to further improve the efficiency of the indoor design teaching resource database, this study constructs an intelligent matching model that can achieve adaptive matching of relevant resources based on the characteristics of indoor design teaching. Specifically, the model mainly consists of three parts, namely information extraction module, classification module, matching module, and evaluation module.

Firstly, in the information extraction module, the main task is to classify the interior design teaching resources in the CAD system and extract relevant information from the classified teaching resources. Knowledge graph technology can also be used to identify the knowledge characteristics of the interior design teaching resources in the CAD system and summarize and organize the knowledge. In the process of classifying interior design teaching resources, not only can interior design teaching resources be divided into three categories, namely teaching case resources, teaching case videos, and teaching resource images, but interior design teaching resources can also be classified, such as theoretical knowledge, design plans, and operational skills. Then, based on the classification of interior design teaching resources, various types of interior design teaching resources can be organized and an interior design teaching resource library can be established. In the matching module, the main task is to match the interior design teaching resources in the CAD system with interior design theoretical knowledge. For example, to match the theoretical knowledge in the CAD system with interior design theoretical knowledge, to match the cases and case videos in the CAD system with interior design theoretical knowledge. The corresponding formulas in this process are as follows:

$$A(b) = \sum_{q=1} \frac{qb_i + \ q-1 \ b_{i-1}}{q^2 + \ q-1 \ ^2} \tag{1}$$

$$B(b) = \sum_{q=1} \frac{qb_i + \ q-1 \ b_{i-1}}{q^2 b_i^2 + \ q+1 \ ^2 b_{i+1}^2} \tag{2}$$

At this point, based on the relevant judgment conditions of the initialized intelligent matching model, it can be concluded that:

$$C(b) = \sum_{q=1} \frac{\sqrt{q \ q-1}}{q^2 b_i^2 + \ q+1 \ ^2 b_{i+1}^2} \tag{3}$$

$$D(b) = \sum_{q=1} \left(q + \frac{qb_i + \ q-1 \ b_{i-1}}{q^2 b_i^2 + \ q+1 \ ^2 b_{i+1}^2} \right) \tag{4}$$

$$M(b) = \sum_{q=1} \sqrt{\frac{qb_i}{q^2 b_i^2 + \ q+1\ ^2 b_{i+1}^2}} \tag{5}$$

The formula $A(b)$、$B(b)$、$C(b)$、$D(b)$、$M(b)$ represents the data classification function, information extraction function, feature recognition function, matching verification function, and inductive judgment function in the intelligent matching model, b_i represents the interior design data element and q represents the number of judgments.

Secondly, after completing the information extraction, it is necessary to classify the relevant data. In the classification module, the main task is to classify interior design teaching resources by profession, classify the interior design teaching resource library by different professions, and classify interior design teaching resources according to the specific needs of different professions. At the same time, the interior design teaching resource library can also be subdivided. For example, according to different interior design majors, interior design teaching resources can be divided into four categories: graphic design, interior decoration, home decoration, and product design; According to the different majors in interior design, interior design teaching resources can be divided into three categories: architectural decoration engineering technology and landscape engineering. The corresponding formulas in this process are as follows:

$$A'(b) = \sum_{q=1} \sqrt{\frac{qb_i + \ yq+1\ b_{i-1}}{q^2 + \ yq+1\ ^2}} \tag{6}$$

$$B'(b) = \sum_{q=1} \sqrt{\frac{yqb_i + \ yq+1\ b_{i-1}}{q^2 b_i^2 + \ q+2\ ^2 b_{i+1}^2}} \tag{7}$$

At this point, based on the relevant judgment conditions of the intelligent matching model in the classification stage, it can be concluded that:

$$C'(b) = \sum_{q=1} \left(y + \frac{\sqrt{yq\ q-1}}{\sqrt{q^2 b_i^2 + \ q+1\ ^2 b_{i+1}^2}} \right) \tag{8}$$

$$D'(b) = \sum_{q=1} \left(q^2 + \sqrt{\frac{qb_i + \ yq-1\ b_{i-1}}{q^2 b_i^2 + \ yq+1\ ^2 b_{i+1}^2}} \right) \tag{9}$$

$$M'(b) = \sum_{q=1} \sqrt{\frac{yqb_i}{\sqrt{q^2 b_i^2 + \ q+1\ ^2 b_{i+1}^2}}} \tag{10}$$

The formula $A'(b)$、$B'(b)$、$C'(b)$、$D'(b)$、$M'(b)$ represents the data classification function, information extraction function, feature recognition function, matching verification function, and inductive judgment function in the intelligent matching model, b_i represents the interior design data element, q represents the number of judgments and y represents the number of cycles.

Finally, in the matching module, the main approach is to construct an evaluation model for interior design teaching resources and to evaluate them using methods comprehensively. In the process of constructing the evaluation model, a corresponding evaluation index system can be established, as well as the characteristics of the interior design teaching resource library. The corresponding experimental results are shown in Figure 2.

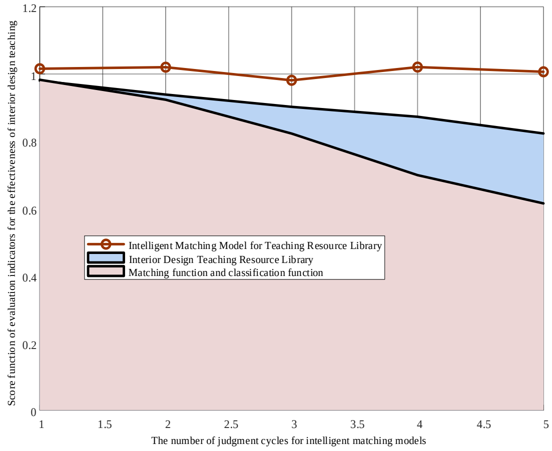

Figure 2: Experimental results of the evaluation process of interior design teaching resources.

Based on the specific characteristics of the interior design, a corresponding evaluation index system is constructed, such as classifying the interior design teaching resource library by profession. In the process of constructing the evaluation module, a corresponding evaluation model can also be constructed by combining it with the theoretical knowledge of interior design. In addition, after establishing the evaluation model, the comprehensive evaluation of the interior design teaching resource library can be completed by evaluating and calculating the evaluation model. After completing the above four parts, the construction of an intelligent matching model for the interior design teaching resource library based on the CAD system can be completed. The corresponding experimental results at this time are shown in Figure 3.

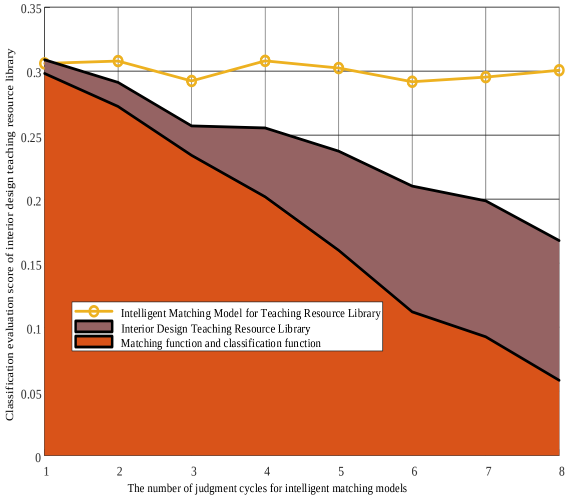

Figure 3: Experimental results of intelligent matching model for interior design teaching resource library based on CAD system.

From the results in Figures 2 and 3, it can be seen that in the process of building an intelligent matching model for the interior design teaching resource library based on CAD systems, the first step is to determine the usage process of the intelligent matching model for the interior design resource library. In the design process of the interior design resource library, the intelligent matching model is used to search, classify, and organize the interior design teaching resources in the CAD system. Then, based on the classification situation in the interior design teaching resource library, the corresponding relationship between the intelligent matching model and the interior design teaching resource library in the CAD system is established. Finally, by organically integrating the CAD system with the interior design teaching resource library, an intelligent matching model for the interior design teaching resource library based on the CAD system can be constructed. In this process, it is necessary to use CAD systems as carriers to improve and optimize the indoor design teaching resource library.

3.3 Optimization Strategy for Intelligent Matching Model

This study found that the learning speed and results of the initial matching model gradually decrease with the increase in learning time. In order to solve this problem and improve the problems of the intelligent matching model during the initial experimental process, this study optimized and improved it from three aspects.

Specifically, in the initial model, the number of categories in the indoor design teaching resource library needs to be adjusted based on learning time and the number of categories in the indoor design teaching resource library. When the learning time is long, the number of categories in the indoor design teaching resource library in the initial model cannot adapt to the growth of learning time. Therefore, this study expands the adjustment range of the number of categories in the indoor design teaching resource library in the initial model from the original 6 categories to 8 categories, which can effectively achieve dynamic control of parameters. The corresponding formulas in this process are as follows:

$$A''(b) = \frac{\sum_{q=1} \sqrt{\frac{qb_i + \ yq+1 \ b_{i-1}}{q^2 + \ yq+1^{\ 2}}}}{y+1} \tag{11}$$

$$B''(b) = \frac{\sum_{q=1} \sqrt{\frac{yqb_i + \ yq+1 \ b_{i-1}}{q^2 b_i^2 + \ q+2^{\ 2} \ b_{i+1}^2}}}{y-1} \tag{12}$$

At this point, based on the relevant judgment conditions of the intelligent matching model in the parameter adjustment stage, it can be concluded that:

$$C''(b) = \sum_{q=1} \left(\frac{y}{q^2 b_i^2} + \frac{\sqrt{yq \ q-1}}{\sqrt{q^2 b_i^2 + \ q+1^{\ 2} \ b_{i+1}^2}} \right) \tag{13}$$

$$D''(b) = \sum_{q=1} \left(\frac{q^2}{q+y} + \sqrt{\frac{qb_i + \ yq-1 \ b_{i-1}}{q^2 b_i^2 + \ yq+1^{\ 2} \ b_{i+1}^2}} \right) \tag{14}$$

$$M''(b) = \sum_{q=1} \sqrt{\frac{y}{yq+1} + \frac{yqb_i}{\sqrt{q^2 b_i^2 + \ q+1^{\ 2} \ b_{i+1}^2}}} \tag{15}$$

The formula $A'(b)$、$B'(b)$、$C'(b)$、$D'(b)$、$M'(b)$ represents the data classification function, information extraction function, feature recognition function, matching verification function, and inductive judgment function in the intelligent matching model, b_i represents the interior design data element, q represents the number of judgments and y represents the number of cycles.

Secondly, reallocate the weights in the initial model. In the initial model, the weight allocation of the interior design teaching resource library is mainly dynamically allocated based on the length of learning time. The longer the learning time, the more weight allocation there is in the interior design teaching resource library; Therefore, the optimization method for weight allocation in the interior design teaching resource library is dynamically adjusted based on the classification quantity and learning time of the interior design teaching resource library. This study adjusted the weight allocation ratio in the interior design teaching resource library for shorter learning times to 75% and for longer learning times to 50%. Through dynamic adjustment of weight allocation, resource mobilization and reliability in the resource library can be effectively improved. The experimental results of reallocating weights in the initial model are shown in Figure 4.

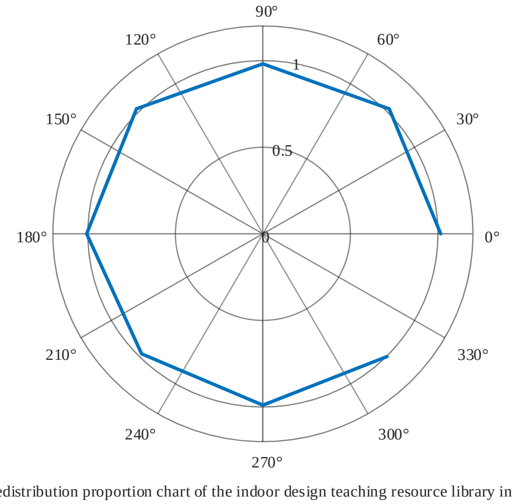

Figure 4: Experimental results on weight allocation of indoor design teaching resource library in the initial model.

Finally, the parameters in the initial model are recorded to better adapt to the actual needs of the interior design teaching resource library. In the initial model, the number of parameters in the interior design teaching resource library needs to be dynamically encoded based on learning time. When the 3D model of the building and the terrain are displayed in the same scene, the real terrain is uneven. The elevation set for building export is the height of the project base point. The building has a section located below the project baseline, which requires matching and fitting the terrain with the building model. Therefore, this study adjusted the number of codes in the initial model to 15. When the learning time is long, the number of codes in the interior design teaching resource library cannot adapt to the growth of learning time. Therefore, this study adjusted the number of classifications in the initial model to 20. By re-coding the parameters, further intelligent adaptation of the intelligent matching model can be achieved, effectively achieving efficient matching of multiple interior design teaching resource libraries. Through these three improvements, the initial model can be made more in line with the actual needs of the interior design teaching resource library. The three-dimensional simulation results of the classification quantity, learning speed, and learning results of the indoor design teaching resource library in the initial model are shown in Figure 5.

After optimizing the above model, an experimental analysis was conducted. From the results in Figures 4 and 5, it can be seen that there is a significant negative correlation between the number of classifications in the interior design teaching resource library and the learning speed and results. This is because there is no direct positive correlation between the number of classifications in the interior design teaching resource library and the learning speed and results, and there is a significant negative correlation between the number of classifications in the initial model and the learning results. This indicates that the setting of the number of classifications in the interior design teaching resource library in the initial model has a certain degree of impact on the learning speed and results in the interior design teaching resource library.

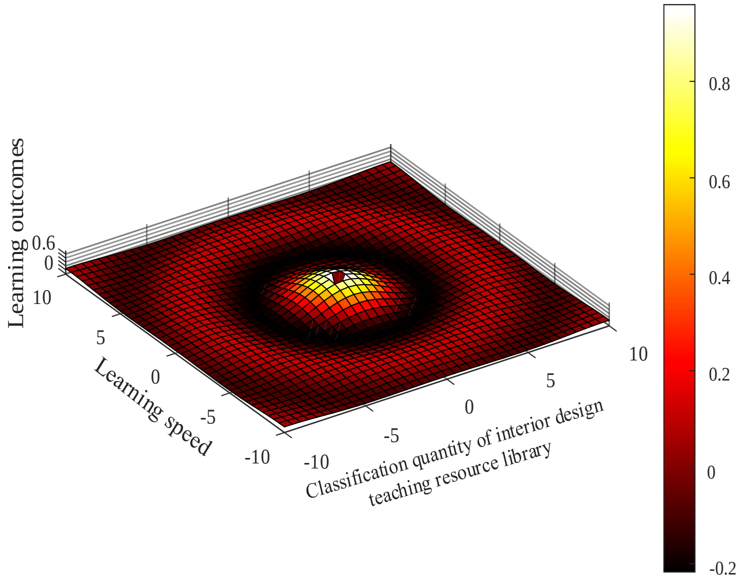

Figure 5: The three-dimensional simulation results of the number of classifications, learning speed, and learning results of the interior design teaching resource library.

4 EXPERIMENT AND RESULT ANALYSIS

4.1 Experiment Design

In order to further verify the effectiveness of visualized teaching in the interior design teaching resource library based on CAD systems, this study designed relevant experiments on visualized teaching. During the experimental design process, by analyzing the teaching content, teaching objectives, teaching priorities, and teaching difficulties of the interior design course, the "Indoor Ceiling" chapter in the "Building Decoration and Decoration Engineering" course was selected as the experimental objective. Based on the actual teaching content, visualized teaching of the interior design teaching resource library based on CAD systems was carried out, with students as the centre and teachers as the lead. The content of this chapter was visualized through the establishment of an interior design teaching resource library based on CAD systems, and various methods such as student self-directed learning, group cooperative learning, and teacher-classroom teaching were used to stimulate students' learning enthusiasm. And initiative, ultimately achieving visualization of knowledge content. In this study, questionnaires and interviews were used to investigate. The experimental results are shown in Figure 6.

From Figure 6, it can be seen that compared to traditional visual teaching methods, the use of a CAD-based indoor design teaching resource library for visual teaching has significant improvements in teaching quality, teaching efficiency, and teaching interactivity. This is because this resource library has the following advantages: firstly, it can effectively help students master indoor design knowledge, enhance their understanding ability of knowledge, and deepen their memory of knowledge; Since in this system, the component dataset creates layers based on field names and field types. Components with the same field name and field type belong to the same layer. The operation object of the model translation function is a part or all components of a certain layer, and it is not possible to select all objects of a single building.

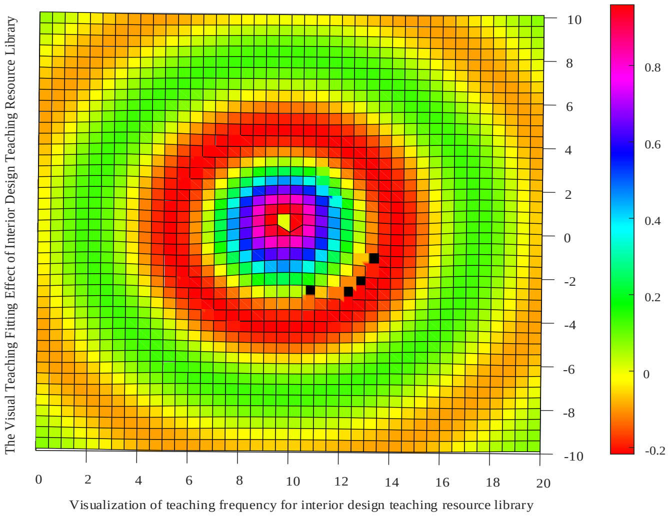

Figure 6: Visualization Teaching Experiment Results of Interior Design Teaching Resource Library Based on CAD System.

So if we want to uniformly move all 3D models in the current scene in the same direction and distance. It is necessary to input the offset amount through the function of batch displacement of the model to achieve the overall displacement of all building models. To move a part or a single building within it, it is necessary to select each component layer related to it through the model displacement function and repeatedly input the offset to complete the displacement operation.

4.2 Results Analysis

In order to objectively evaluate the intelligent matching model of the interior design teaching resource library based on CAD systems, this study also conducted a secondary analysis of the experimental results mentioned above. After three-dimensional fitting, the results are shown in Figure 7.

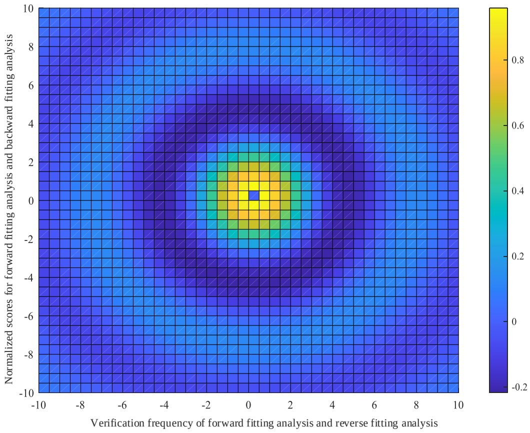

Figure 7: The 3D fitting results of visualized teaching experiment data in the interior design teaching resource library.

From the above experimental analysis results, it can be seen that compared to the traditional teaching process of indoor teaching resource libraries, the visualization teaching based on the intelligent matching model of CAD system's indoor design teaching resource library has obvious advantages, mainly reflected in the following two aspects: first, in the visualization teaching process of CAD system's indoor design teaching resource library, students can fully express their learning experience and knowledge reserves, judge their knowledge mastery more accurately, and better integrate knowledge points, thereby improving teaching efficiency. Secondly, in the visualization teaching process of interior design teaching resource library based on CAD system, teachers can use intelligent matching models to have a clearer understanding of students' knowledge mastery and learning ability, thereby effectively improving teaching quality.

5 CONCLUSIONS

The construction and application of an interior design teaching resource library based on CAD systems have fundamentally changed the problems of resource scarcity, low utilization, and poor learning effectiveness in the interior design teaching process. This article takes the construction of an interior design teaching resource library based on CAD systems as the research object. Firstly, the construction principles, content, and application advantages of this resource library are analyzed. Then, a case-based system design method is adopted to design it. Finally, visualization technology is used to conduct application experiments in interior design teaching, verifying that the interior design teaching resource library based on CAD systems has good application effects. The results of this study indicate that the construction of this resource library can not only meet the learning needs of students for basic knowledge of interior design but also meet the learning needs of students for professional knowledge of interior design. Moreover, it can play a good application effect in visual teaching, fully reflecting the importance of building an interior design teaching resource library based on CAD systems in the process of interior design teaching. In addition, during the construction process, it is necessary to be based on reality, fully consider the actual needs and characteristics of students, strengthen innovation in its construction content and functions, and actively cooperate with industry enterprises to expand its content and functions, so as to better serve teaching activities and student learning.

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