Research on the Construction of a Specialized Training Platform for Intelligent Space and Creative Design Empowered by AI

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Abstract. With the rapid development of artificial intelligence technology, its application in various fields is becoming increasingly widespread. This article focuses on how to build an AI empowered intelligent space and creative design training platform, aiming to explore the path and methods of deep integration of artificial intelligence technology and creative design education, and provide strong support for cultivating creative design talents with innovative and practical abilities. Through the study of theories related to intelligent space and creative design, combined with the construction goals and functional requirements of the training platform, a training platform architecture based on AI technology is proposed, and the key technology implementation and practical application scenarios of the platform are discussed, in order to provide reference and inspiration for educational practices in related fields.

Keywords: AI; Intelligent Space and Creative Design Major; Construction of Training Platform.

1. Introduction

Entering the digital age, intelligent space and creative design are gradually becoming one of the important practice and application areas to promote social development and innovation. Smart spaces integrate advanced technologies such as the Internet of Things, big data, and artificial intelligence to create a more convenient, comfortable, and efficient living and working environment; Creative design emphasizes the combination of innovative thinking and artistic aesthetics, injecting unique cultural connotations and artistic values into smart spaces. In order to cultivate intelligent space and creative design professionals who can meet the needs of the times, it is particularly crucial to build a specialized training platform that can fully utilize AI technology[1].

2. Theoretical Basis Related to Intelligent Space and Creative Design

2.1 Overview of Smart Space

Smart space refers to a place where various intelligent technologies, such as sensor networks, automation control systems, artificial intelligence algorithms, etc., are utilized to achieve interconnectivity and intelligent management of devices within the space. Its core goal is to improve the comfort, safety, and energy efficiency of the space, while providing users with a more personalized and convenient experience. For example, smart home systems can automatically adjust indoor temperature, lighting brightness, curtain opening and closing according to users' living habits, and smart office spaces can optimize office resource allocation and environmental settings based on employees' work status.

2.2 Connotation of Creative Design

Creative design is a design activity that combines innovative thinking, artistic aesthetics, and practical functionality. It is not just about beautifying the appearance of objects, but also creating products, spaces, or services with novelty, uniqueness, and value through unique design concepts and methods. Creative design covers multiple fields, including industrial design, architectural design, interior design, graphic design, etc. In the construction of smart spaces, creative design plays a crucial role in transforming cold technology into emotional and warm spatial experiences, making smart spaces more attractive and humanized.

3. Construction Goals and Functional Requirements of AI-Enabled Intelligent Space and Creative Design Training Platform [2]

3.1 Construction Objectives

3.1.1 Talent Cultivation:

Cultivate high-quality applied talents with solid professional knowledge and skills in intelligent space and creative design, as well as innovative thinking and practical abilities, to meet the industry's demand for compound talents.

3.1.2 Skill Enhancement:

Provide students and practitioners with a practical platform to enable them to master proficiently the application of AI technology in intelligent Spaces and creative design, including the planning and layout of intelligent Spaces, the generation and optimization of creative design schemes, and the application of virtual reality and augmented reality technologies in design presentations, etc.

3.1.3 Industry Alignment:

Closely integrating the actual demands of the intelligent space and creative design industries, promoting the deep integration of education and industry, providing students with employment and entrepreneurship opportunities, and also offering talent support and technical services to enterprises.

3.2 Functional Requirements

3.2.1 Intelligent Space Design Simulation:

Provide virtual intelligent space environments, such as smart homes, smart offices, and smart commercial Spaces, allowing students to conduct space planning, layout design, equipment selection, and scene construction in a virtual environment, simulating real design processes and application scenarios.

3.2.2 Creative Design Assistance Tools:

Integrate AI-assisted design tools, such as intelligent design recommendation systems, creative inspiration generators, and automatic matching of design elements, to help students quickly generate creative design plans, improving design efficiency and quality.

3.2.3 Virtual Reality and Augmented Reality Experience:

By leveraging VR and AR technologies, immersive display and experience of design works can be achieved, allowing students to have a more intuitive understanding of the design effects. It can also be used for the display and promotion of design achievements.

3.2.4 Intelligent Evaluation and Feedback:

Establish an intelligent evaluation system to automatically assess and analyze students' creative design plans and intelligent space design works, provide detailed feedback, help students identify problems and deficiencies in their designs, and promote their continuous improvement and enhancement.

3.2.5 Resource Library Construction:

Build a rich resource library for intelligent space and creative design, including a design case library, material library, model library, technical document library, etc., to provide students with resource support for learning and creation.

4. Architecture Design of the Intelligent Space and Creative Design Training Platform based on AI Technology

4.1 Overall Platform Architecture

This training platform adopts a hierarchical architecture design, mainly divided into the infrastructure layer, data layer, application support layer, business logic layer and user interface layer.

4.1.1 Infrastructure Layer:

It includes hardware facilities such as servers, storage devices, network devices, and computing resources, providing the basic computing and storage capabilities for the operation of the platform. At the same time, necessary software infrastructure should be equipped, such as operating systems, database management systems, Web servers, etc.

4.1.2 Data Layer:

It is responsible for storing and managing various types of data on the platform, including intelligent spatial data (such as spatial layout, equipment information, environmental data, etc.), creative design data (such as design plans, design elements, material resources, etc.), user data (such as student information, teacher information, user preferences, etc.), and log data generated by the platform's operation, etc. Data is integrated and stored through technologies such as data warehouses and data lakes to provide data support for upper-layer applications.

4.1.3 Application Support Layer:

Provide general technical support services required by the platform, such as AI algorithm services, VR/AR engines, cloud computing services, big data analysis services, etc. These services are provided to the upper-level business logic layer in the form of apis for invocation, enabling the intelligent functions and high-performance operation of the platform.

4.1.4 Business Logic Layer:

It is the core part of the platform. According to the business requirements of the training platform, it realizes business function modules such as intelligent space design simulation, creative design assistance tools, virtual reality and augmented reality experience, intelligent evaluation and feedback. Each functional module has its corresponding business logic processing flow and rules to handle and respond to user requests.

4.1.5 User Interface Layer:

Provide users with a more friendly and convenient operation interface, including Web interface and mobile interface. Users can log in to the platform through the interface to engage in activities such as intelligent space design, creative creation, work display, and learning exchange [3].

4.2 Key Technology Implementation

4.2.1 Intelligent Design Recommendation System:

Based on the collaborative filtering algorithm and content recommendation algorithm in machine learning, it recommends suitable design schemes, design elements, material selections, etc. to users according to their design style preferences, historical operation records, and the design requirements of similar users. Through the analysis and learning of a large number of design cases and user data, the recommendation model is continuously optimized to improve the accuracy and personalization of recommendations.

4.2.2 Creative Inspiration Generator:

By leveraging the Generative Adversarial Network (GAN) technology in deep learning and training on a large amount of image data such as design images, artworks, and natural landscapes, it generates creative and artistic design inspiration images. Users can draw inspiration from the generated images and create creative designs.

4.2.3 Automatic Matching of Design Elements:

Based on image recognition technology and semantic understanding algorithms, feature extraction and analysis of design elements (such as color, material, texture, shape, etc.) are carried out to achieve automatic matching and recommendation among design elements. For instance, in interior design, based on the furniture style chosen by the user, matching decorative elements such as curtains, carpets and lamps are automatically recommended to enhance the coordination and efficiency of the design.

4.3 The Integration of Virtual Reality and Augmented Reality Technologies [4]

4.3.1 VR Scene Construction:

Use professional 3D modeling software and VR development engines (such as Unity, Unreal Engine, etc.), combined with the design data of intelligent Spaces, to create highly realistic virtual intelligent space scenes. By setting interactive elements and physical rules in the scene, users can freely roam, operate devices, switch scenes and perform other interactive operations in the virtual environment, as if they were in a real intelligent space.

4.3.2 AR Design Presentation:

Utilizing AR technology, virtual design schemes are integrated and displayed with the real space. Users can directly view the designed smart space layout, furniture placement, decorative effects, etc. in real scenes through mobile phones or AR glasses and other devices, and get a taste of the design results in advance. Meanwhile, it supports users in making real-time adjustments and modifications to design elements, achieving seamless interaction between design and reality.

4.4 Intelligent Evaluation and Feedback System

4.4.1 Rule-based Evaluation:

A series of evaluation rules are formulated in accordance with industry standards, norms and aesthetic principles for intelligent space design and creative design. The system automatically checks and evaluates the design works submitted by users, such as the rationality of spatial layout, the accuracy of equipment selection, the consistency of design style, and the coordination of color matching, and generates a detailed evaluation report, pointing out the problems existing in the works and providing improvement suggestions.

4.4.2 AI-based Evaluation:

Utilizing image recognition and natural language processing technologies in deep learning, analyze and evaluate the image and text descriptions of the design scheme. Through training on a large number of outstanding design works and design schemes, an intelligent evaluation model is constructed, which can comprehensively assess the works from multiple dimensions such as creativity, artistry, and practicality, and provide corresponding scores and feedback. Meanwhile, the system can also learn users' evaluation habits and preferences, continuously optimize the evaluation results, and improve the accuracy and reliability of the evaluation [5].

5. Practical Application Scenarios and Case Analysis of the Training Platform

5.1 As a Practical Training Platform for the Teaching of Intelligent Space Design Courses

In the intelligent space design course of colleges and universities, teachers can use this practical training platform to carry out teaching activities. Students conduct design practices of smart home, smart office and other Spaces through the intelligent space design simulation function of the platform. During the design process, students can invoke the platform's AI-assisted tools, such as the intelligent design recommendation system to recommend suitable design schemes and equipment selections for them, the creative inspiration generator to help them expand their design ideas, and the automatic matching function of design elements to ensure the coordination of design elements. After completing the design plan, students can use VR and AR functions to display and experience the design results,

and feel the actual effect of the design. Meanwhile, the intelligent assessment system will evaluate and provide feedback on students' design works, helping them promptly identify and solve problems and improve their design skills. For instance, a certain university has adopted this training platform in its smart home design course. The smart home solutions designed by the students have been showcased and highly praised at actual smart home exhibitions, fully demonstrating the application value of the platform in teaching practice [6].

5.2 As a Practical Training Platform for the Cultivation and Training of Creative Design Thinking

For creative design studios or design teams, this training platform can serve as an important tool for project practice. When receiving creative design projects related to smart Spaces, designers can collaborate on team design on the platform. Through the design materials and cases in the shared resource library, team members can quickly obtain inspiration and reference materials. During the design process, AI-assisted tools are utilized to enhance design efficiency, such as automatically generating design sketches and recommending creative element combinations. Meanwhile, the intelligent evaluation function of the platform is utilized to optimize and improve the design plan multiple times to ensure its quality and innovation. Ultimately, the design results are presented to customers through VR and AR technologies to enhance their recognition and satisfaction with the design plans. For instance, when a creative design studio was designing an intelligent commercial space project, it successfully created a commercial space design plan with unique creativity and intelligent experience for the client by leveraging this training platform. The project was smoothly implemented and received high praise from the client [7].

6. Conclusion and Prospects

This paper presents a construction plan for a specialized training platform for intelligent space and creative design based on AI technology. Through detailed elaboration on the platform's construction goals, functional requirements, architecture design, and key technology implementation, it demonstrates the significant role of this platform in talent cultivation, skill enhancement, and industrial connection. In practical application scenarios, this platform has achieved excellent results in both university teaching and design studio project practices, providing strong support for the education and industrial development in the fields of intelligent space and creative design.

However, with the continuous development of technology and the changing demands of the industry, there are still many directions for improvement and expansion of this training platform. For instance, in terms of AI algorithms, the algorithms of recommendation systems and creative inspiration generators can be further optimized to enhance their accuracy and creativity. In terms of virtual reality and augmented reality technologies, integration with other emerging technologies (such as 5G and the Internet of Things) can be strengthened to achieve a smoother and more realistic immersive experience. In terms of the construction of the platform's resource library, the content of the resources can be continuously enriched and updated, and more high-quality industry cases and cutting-edge technical materials can be introduced. In conclusion, in the future, we will continue to explore and improve this training platform, cultivate more outstanding professional talents for the development of the intelligent space and creative design field, and promote the innovation and development of the industry.

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