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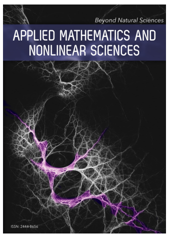

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Application and Practice of Artificial Intelligence Technology in Interior Design

Mingchan Gong †

School of design and art, Hunan Institute of Technology, Hengyang, Hunan, 421000, China

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Abstract

In order to enhance the technical innovation of interior design, this paper proposes an interior design approach based on artificial intelligence technology to optimize the overall scheme of interior design. The shape and contour features of different kinds of objects in the interior are modeled by visual information design, the information components of the visual images are determined using correlation scale analysis, and the maximum grayscale values are marked to implement 3D visual feature reconstruction. The reconstruction process is based on accurately aligned point cloud data, and parametric surface reconstruction is implemented for the target objects to obtain a more accurate 3D interior design model and make the interior scene simulation more realistic. In order to verify the effectiveness of the application of the interior design method based on artificial intelligence technology, simulation design experiments are conducted. The results show that the multi-element fusion (TBG) consideration characteristics of the proposed method are more uniformly distributed. The visual saturation and stereo image design levels reach 98% and 88.51%, respectively. The average error result is 0.06, which are both better than the 3D vision-based interior design method and the multi-element fusion-based interior design method, and have higher design reliability. It can be seen that the interior design method based on artificial intelligence technology helps to enhance the effect of intelligent application of interior design and promotes the optimization and upgrading of the interior design working experience.

Keywords: Interior design; Artificial intelligence technology; Visual information design; 3D visual feature reconstruction; Point cloud data
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†Corresponding author.
Email address: 2000001200@hnit.edu.cn

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1 Introduction

Interior design is a highly integrated and independent discipline that encompasses many aspects of psychology and design aesthetics and is a new design concept that has grown based on the development of the architectural industry [1-2]. Interior design combines three-dimensional visualization with multi-element fusion techniques, using the different characteristics between multiple elements to apply architectural design approaches to interior design, allowing the design parameters to be reassembled and optimized [3-6]. The interior design uses graphics to express the designer's way of thinking and design style, which is a silent language for the designer to communicate with himself or herself and an important basis for the designer to communicate with the builder or client about the interior design solution [7-11].

To promote innovation in the field of interior design, an increasing number of designers are engaged in technological innovation [12-14]. For example, a new predictive modeling approach is proposed in the literature [15] to select an optimal architecture from the entire spatial structure to estimate the area and delay mapped to a specific architecture. The area and delay models obtained from nonlinear programming calculations are then used to guide the design of space exploration. In the literature [16], a hybrid metamodel-based design space differentiation method is proposed for a practical problem, where an iteratively reduced hope region is constructed using cloud points, and two different search strategies are used in the interior and exterior of the hope region. This method is proved to have high search accuracy and efficiency by testing the benchmark mathematical functions. A new shape deformation method is proposed in the literature [17] to optimize the design task. The method is based on the spatial deformation technique of moving least squares, which overcomes the spatial deformation limitation of radial basis functions, thus facilitating the development of changes in design shape exploration. The literature [18] proposes an efficient design generation technique based on a cache coherence protocol in simulation verification. The technique efficiently analyzes the state space structure to generate an immediate and efficient test sequence, which guarantees important transition choices while omitting similar transitions. The literature [19] innovates an incremental timing-driven placement tool to optimize critical timing paths through free-space-aware path smoothing and to evaluate relocation-induced timing changes through incremental static timing. The placement tool demonstrates the effectiveness of integrated optimization of uniform spaces and incremental placement design. In summary, technological innovations in interior design focus on graphic thinking and spatial design, lacking the 3D intelligent technical means to represent the real conditions of the interior visually and lacking the practice of drawing interior landscapes into 3D stereoscopic images that do not facilitate an intuitive understanding of design intent.

Based on this, this paper stands for the perspective of technological innovation and proposes a method of interior design based on artificial intelligence technology to optimize the effect of interior design by applying it to the overall interior design process. Firstly, the shape contour features of different kinds of objects in the interior are modeled by visual information design. Secondly, the information components of the interior design visual images are determined by using the correlation scale analysis method. The LBG vector quantization method is introduced in the design process to mark the maximum gray value of the interior design visual images. The 3D contour feature volume of the interior design visual images is extracted for visual feature reconstruction. Finally, a parametric surface reconstruction of the target object is implemented based on accurately aligned point cloud data to obtain a more accurate 3D interior design model. The design method simulates the actual effect of interior design through experiments and demonstrates its superiority in TBG consideration feature distribution, visual saturation, stereo image design level, and spatial reconstruction detection error. It shows that the interior design method based on artificial intelligence technology can make up for the single expression defect of design drawings and bring a new design experience to the interior design industry.

2 Artificial intelligence interior design

2.1 Visual information design

Applying artificial intelligence techniques to interior design first requires determining the shape and contour features of different objects in the room [20-21]. The interior scenes are modeled using intelligent recognition devices in the following steps:

$$a = \bar{a} + \varepsilon U_1 \tag{1}$$

$$b = \bar{b} + \varepsilon U_t \tag{2}$$

Where, U1 denotes the change matrix of indoor scene contour, Ut denotes the change matrix of indoor scene texture, and ε denotes the control parameter, by changing the control parameter, the contour and texture of different kinds of indoor objects can be obtained.

The coordinates of the indoor scene are calibrated using mobile intelligent devices to realize the conversion of the indoor scene features from two-dimensional to three-dimensional coordinates [22]. A camera is installed on the calibrated coordinate points to capture the environmental images of the indoor points, and assuming that there is an exact coincidence between the optical axes of the camera captured images and the scene coordinates, the equation for coordinate conversion is expressed as:

$$r = \frac{f}{L - a} b \tag{3}$$

In equation (3), f denotes the focal length of the camera and L denotes the shooting distance.

To optimize the visual information of the interior design, the contour features of the visual image of the interior design are decomposed using the snake algorithm in artificial intelligence techniques [23-25]. According to the final result of the contour feature decomposition, the interior design elements are enhanced and the edge point distribution matrix of the interior design can be expressed as:

$$J(x,y,\sigma) = \begin{bmatrix} \frac{\partial p}{\partial x} \\ \frac{\partial p}{\partial y} \end{bmatrix} = \begin{pmatrix} 1 & 0 & L_x(x,y,\sigma) \\ 0 & 1 & L_y(x,y,\sigma) \end{pmatrix} \tag{4}$$

In Eq. (4), $L(x, y, \sigma)$ is the product of $G(x, y, \sigma)$ and $I(x, y, \sigma)$, which represents the seed point of the visual image of interior design, and $I(x, y, \sigma)$ represents the grayscale feature of the visual image of interior design.

According to the graphical method in artificial intelligence techniques, the template matching matrix of interior design is obtained as:

$$M = \begin{bmatrix} L_{xx}(x,y,\sigma)L_{xy}(x,y,\sigma) \\ L_{xy}(x,y,\sigma)L_{yy}(x,y,\sigma) \end{bmatrix} \tag{5}$$

A full range of stereo vision sensors is used to scan the indoor scene, and visual information about the interior design can be obtained. The acquisition steps are:

Step 1: The panoramic image of the interior design is acquired using VR in artificial intelligence technology, and the file is named acquisition information and stored in the storage directory of the panoramic image of the interior.

Step 2: The interior design scene is scanned using a visual information acquisition sensor.

Step 3: The scanned slice of the indoor panoramic image is acquired using the acquisition module of the AI technology, and the position of the visual information acquisition sensor is predicted based on the frequency of information acquisition. The vertical distance value between a single viewpoint and the center of the visual information acquisition sensor is used as the name of the scanned slice of the indoor panoramic image, and the scanned slice of the acquired indoor panoramic image is stored in the indoor panoramic image storage folder.

Step 4: Analyze whether the visual information reaches the limit of the design parameters and if it reaches the limit of the design parameters, the scanning of the interior design scene is completed. Otherwise, return to step 3.

The 3D reconstruction method uses artificial intelligence technology to extract features from the spatial distribution images of interior design. Based on the extracted image features, the edge contours of the spatial distribution images of interior design are detected, and visual information about interior design is obtained.

2.2 Visual feature reconstruction

The information components of the interior design visual images are determined using correlation scale analysis, and the 3D visual features of the interior design are reconstructed by extracting the grayscale pheromone of the visual images and fusing the pixel points of the interior design visual images for processing [26]. The process can be expressed as follows:

$$R = \frac{\langle \tau_d u', \tilde{u} \rangle_{\varphi_{x0}}}{\|\tau_d u\|_{\varphi_{x0}} \|\tilde{u}\|_{\varphi_{x0}}} \tag{6}$$

$$X = \frac{\langle \tau_d u, \tilde{u} \rangle_{\varphi_{x0}} \langle \tau_d u', \tau_d u \rangle_{\varphi_{x0}}}{\|\tau_d u\|_{\varphi_0}^3 \|\tilde{u}\|_{\varphi_{x0}}} \tag{7}$$

In the context of artificial intelligence, regular pixel features are applied to decompose the pixel fusion of interior design visual images, and the fusion output is:

$$\frac{\partial}{\partial d}\left(\frac{\langle \tau_d u, \tilde{u} \rangle_{\varphi_0}}{\|\tau_d u\|_{\varphi_{x0}} \|\tilde{u}\|_{\varphi_{x0}}} \right) = \frac{\langle \tau_d u', \tilde{u} \rangle_{\varphi_{0_0}}}{\|\tau_d u\|_{\varphi_{x0}} \|\tilde{u}\|_{\varphi_{x0}}} \tag{8}$$

$$\frac{\left\langle \tau_d u', \tilde{u} \right\rangle_{\varphi_{00}}}{\left\| \tau_d u \right\|_{\varphi_{x0}} \left\| \tilde{u} \right\|_{\varphi_{x0}}} - \frac{\left\langle \tau_d u, \tilde{u} \right\rangle_{\varphi_{x0}} \left\langle \tau_d u', \tau_d u \right\rangle}{\left(\left\| \tau_d u \right\|_{\varphi_{x0}} \right)^3 \left\| \tilde{u} \right\|_{\varphi_{x0}}} \tag{9}$$

In Eq. (9), $\left\| \tau_d u \right\|_{\varphi_{x0}}$ represents the set of pixels of the interior design visual image after texture merging. Then the color features of the interior design are optimally combined, and the texture segmentation region of the interior design visual image can be obtained as:

$$G = \sum_{r=1}^{t} \sum_{q=1}^{k_2} \left\| W_i^T x_{ir} - W_i^T x_{irq} \right\|^2 B_{irq} \tag{10}$$

$$G = tr\left(W_i^T H_2 W_i \right) \tag{11}$$

In equation (10), H_2 denotes the grid area eigenvalue, which is calculated as:

$$H_2 = \sum_{r=1}^{t} \sum_{q=1}^{k_2} \left(x_{ir} - x_{irq} \right) \left(x_{ir} - x_{irq} \right)^T B_{irq} \tag{12}$$

By segmenting the pixel region of the interior design visual image and matching the adaptive features of the visual image, the optimal design of the visual image can be achieved.

The LBG vector quantization method is introduced in the design process to mark the maximum gray value of the interior design visual image and extract the 3D contour feature volume of the interior design visual image. At this point, a visual image with a fusion center of $d\left(x, y\right)$ can be obtained.

The first k-dimensional feature template of the visual image is described by extracting the gray-scale pheromone as:

$$P(\varphi) = \int \frac{1}{2} \left(\left| \nabla \phi \right| - 1 \right)^2 dx \tag{13}$$

Let X be any set for which any two elements x and y in X correspond to a real number $d\left(x, y\right)$. Then X is said to be a distance space or metric space with distance $d\left(x, y\right)$, where the elements in the distance space are called points. Let the n-dimensional Euclidean space be R^n, denoting the entire set of n-dimensional vectors $x = \left(x_1, x_1, ..., x_n\right)$, then:

$$d\left(x, y\right) = \left[\sum^{n} \left(x_i - y_i \right) \right]^{1/2} \tag{14}$$

In Eq. (14), X is a distance space, and when $n \to \infty$, $d\left(x_n, x\right) \to 0$, then the point column $\left\{x_n\right\}$ converges to x by distance d, and x is the limit of the point column $\left\{x_n\right\}$.

Using the regular pixel feature decomposition method, the local template matching term of the interior design visual image is defined as E^{LBF}, and the sampling component of the pixel points at the edges is defined as E_{RGB}. The template function of the interior design visual image in the region fusion process is constructed using the mobile smart device, and its function expression is:

$$Data\left(x,y,d\left(x,y\right)\right)=\left|u\left(x-d\left(x,y\right),y\right)-\tilde{u}\left(x,y\right)\right|^{2} \tag{15}$$

In Eq. (15), $\tilde{u}\left(x,y\right)$ represents the template image for reference, and $u\left(x-d\left(x,y\right),y\right)$ represents the visual image of the interior design to be reconstructed.

2.3 3D virtual intelligent design

2.3.1 Point cloud generation and noise reduction

Designing point clouds is a direct and simple way to describe a 3D model. Each point in the point cloud contains the 3D coordinates of a spatial point, which can easily carry out operations such as rotation, translation and deflation in geometric space. Using the 3D virtual reconstruction method in artificial intelligence technology, the point cloud is used as the basis for reconstructing the scene, thus generating a highly reproducible model of indoor objects and scene surfaces.

Define a point z(X, Y, Z) in the depth image of Qiming to represent the coordinates of the 3D projection point of this point in the scene, then the following point cloud is generated:

$$\begin{cases}\left(x-\gamma_{x}\right)/f=X/Z\\\left(y-\gamma_{y}\right)/f=Y/Z\\z=Z\end{cases} \tag{16}$$

In equation (16), f epresents the ideal focal length of the depth image acquisition device, and (γ_x, γ_y) represents the calibration center of the camera. The 3D point cloud data of indoor object or scene depth image can be obtained by calculation.

Point cloud data's rough alignment is achieved using the key point feature matching algorithm. After the point cloud data is enhanced, the alignment of the point cloud data acquired under different angles needs to be implemented so that the discrepant point clouds are transformed to the same coordinate system to obtain a complete 3D model of the indoor target object. The principle of key point extraction is shown in Figure 1.

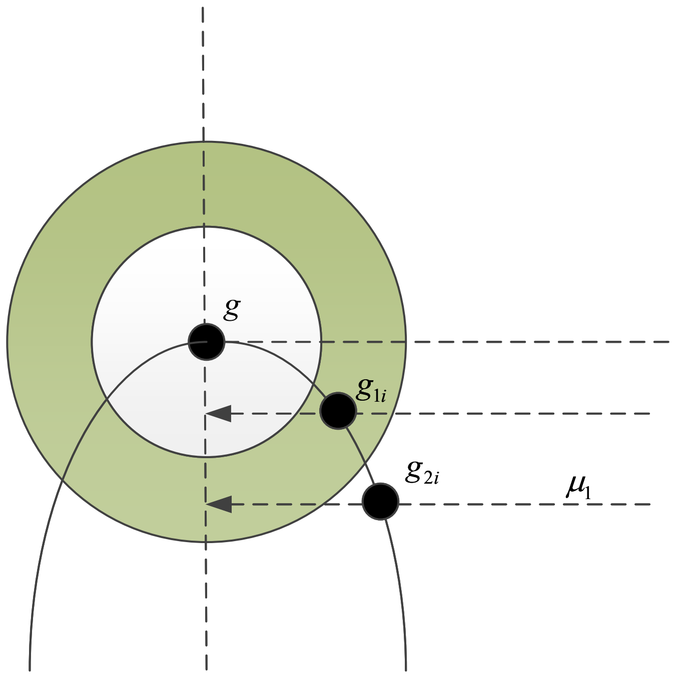


Figure 1. Principle of key point extraction

From Figure 1, the circle is a point cloud cross-section, g denotes a point in the point cloud, and r1, r2 are radii of different sizes centered on the point g. The neighborhoods of r1, r2 are used for the discrepancy scale space simulation, and the normal point vector under the neighborhood benchmark of r1 is obtained and defined as n.

The projection of the normal point vector in the disparity scale space on the point g is:

$$\begin{cases} e_{1i} = abg\left(\overrightarrow{n \cdot (g - g_{1i})}\right) \\ e_{2i} = abg\left(\overrightarrow{n \cdot (g - g_{2i})}\right) \end{cases} \tag{17}$$

In Eq. (17), the points in the scale space of radius r1 and r2 are described by In Eq. (17), the points in the scale space of radius r1 and r2 are described by 1, respectively. All the points in different scale spaces form a vector with the center point and continue to calculate the weighted projection mean value of this vector on the center point to get the key point as: respectively. All the points in different scale spaces form a vector with the center point and continue to calculate the weighted projection mean value of this vector on the center point to get the key point as:

$$\begin{cases} \sigma_1 = \sum \mu e_{1i} \\ \sigma_2 = \sum \mu e_{2i} \end{cases} \tag{18}$$

After the key points are extracted, the geometric consistency algorithm is used to remove the incorrectly matched point pairs and find the correct point pair relationship to obtain the transformation matrix for the preliminary alignment and realize the accurate alignment of the point cloud data.

2.3.2 Intelligent design process

Parametric surface reconstruction of the target object is implemented based on precisely aligned point cloud data to obtain a more accurate 3D interior design model. The flow of the overall intelligent interior design is shown in Figure 2.

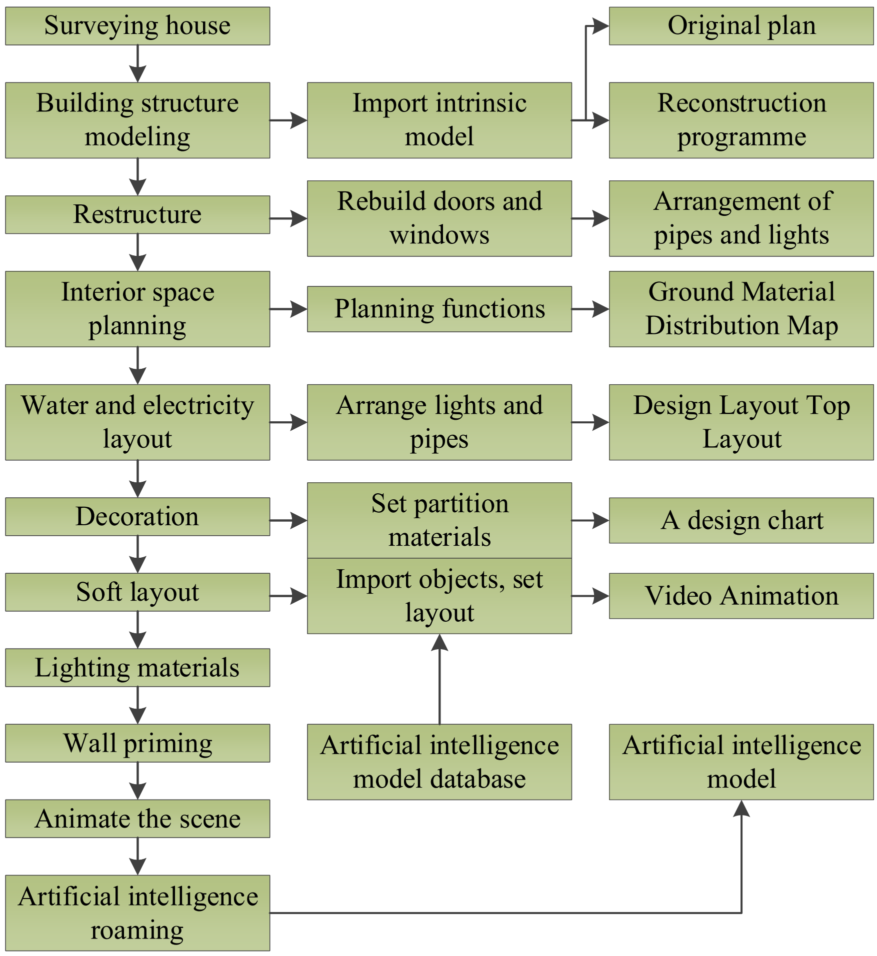


Figure 2. Intelligent interior overall design process

As seen from Figure 2, the intelligent interior overall design process is divided into 2 stages, i.e., soft furnishing design and hard furnishing design. When using artificial intelligence technology for interior scene design, scene animation modeling of house structure is required. By obtaining the visual information of the interior design, using the AI model database to set the zoning materials, and importing the layout of lighting, plumbing, and other layout settings to design the top layout diagram to realize the intelligent transformation of the interior design.

2.3.3 3D scene reconstruction

The 3D modeling-based interior landscape design system includes a 3D visual image reconstruction module and a VRLM viewer module. The 3D visual image reconstruction module mainly uses 3D modeling technology to reconstruct the interior landscape in 3D. The points to be matched in this module are mainly single pixel points whose corner point distribution Jacobi matrix is:

$$J(x,y,\sigma)=\begin{bmatrix} P \\ \overline{x} \\ P \\ \overline{y} \end{bmatrix}=\begin{bmatrix} 1 & 0 & L_x(x,y,\sigma) \\ 0 & 1 & L_y(x,y,\sigma) \end{bmatrix} \tag{19}$$

In Eq. (19), $I(x,y)$ denotes a single pixel point, $L(x,y,\sigma)$ denotes a 3D reconstructed image pixel point of the interior landscape, and $P(x,y,L(x,y,\sigma))$ denotes the edge contour feature amount of the 3D reconstructed image pixel point.

The 3D scene reconstruction of the interior landscape is performed using the region attribute block matrix of the 3D reconstructed image of the interior landscape, and the reconstruction process is shown in Figure 3.

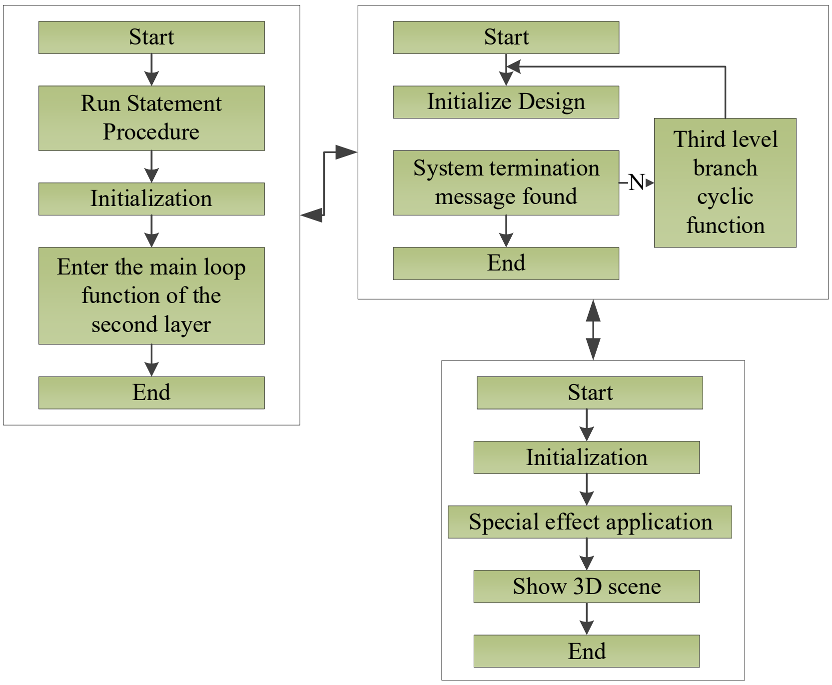


Figure 3. 3-D scene reconstruction process

As seen from Figure 3, the reconstruction of the 3D scene first needs to extract the image features and calculate the feature matching between images for sparse reconstruction to obtain the camera poses and sparse feature point clouds of each image. The dense reconstruction of camera poses leads to a dense point cloud reconstruction mesh, voxel, or texture. On the AI cloud server, the 3D scene reconstruction model can be obtained after a series of work such as noise reduction, stitching, and color texture matching on the collected data.

In order to obtain the desired rendering of interior scenes in interior design. Before 3D rendering, each interior design 3D rendering parameter needs to be corrected, and the rendering process of the interior design scene is shown in Figure 4.

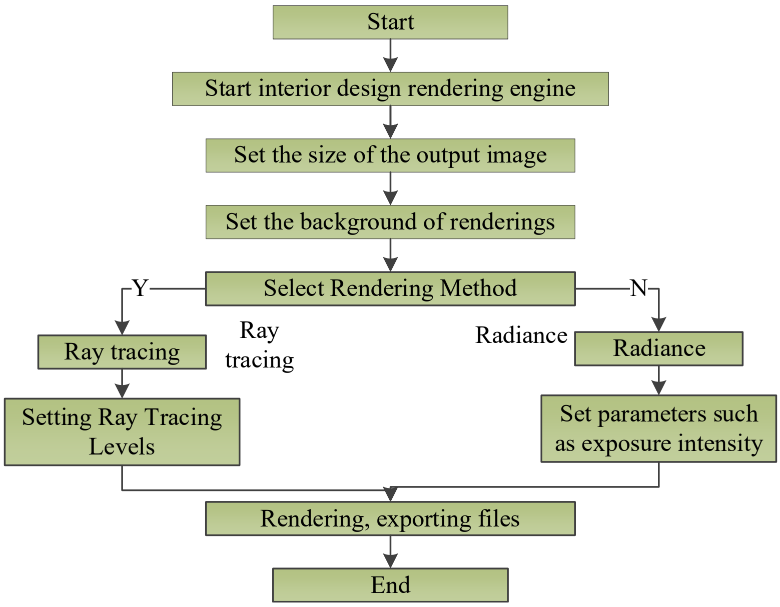


Figure 4. Rendering process of the interior design scene

As can be seen from Figure 4, the coordinates of each scene can be calculated by the 3D rendering parameters. Firstly, the material textures of the interior design scene are added to the scene entities one by one through the ambient light parameters and transparency parameters of the interior design process. Then at the end of the rendering design stage, the entity information of the interior design scene is corrected in combination with the modifier device to add the scene configuration to it, making the simulation of the interior scene more realistic.

3 Artificial intelligence interior design results analysis

In this paper, an interior design method based on artificial intelligence technology combines visual information features and models interior scenes using 3D virtual intelligent design. The interior design method based on AI technology is compared with the interior design method based on multi-element fusion and the interior design method based on the 3D vision to detect the actual design effects of TBG consideration characteristics, visual saturation, stereo image design level, and spatial reconstruction errors.

3.1 TBG consideration characteristics

The TBG consideration characteristic is a constant determining whether the interior design is missing. The three methods were compared for TBG consideration characteristics, and the experimental results are shown in Figure 5.

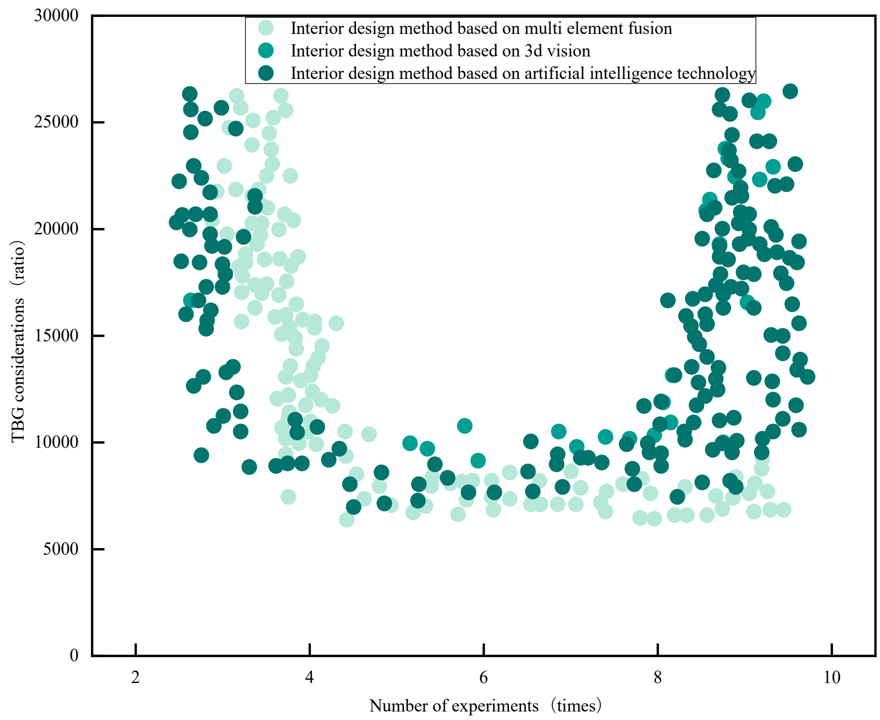


Figure 5. Distribution of TBG consideration characteristics

Figure 5 shows that the distribution of TBG consideration characteristics of the multi-element fusion-based interior design method is very dense in the number of experiments from 1 to 4, mainly concentrated between 15,000 ratios and 20,000 ratios. In the end experiment, the distribution of TBG consideration characteristics is mainly below 6000 ratios, indicating a design deficiency in this method in the interior design process. The 3D vision-based interior design method does not have a distribution of TBG consideration characteristics at 1-2 experiments but has a dense distribution of TBG consideration characteristics above 20,000 ratios at 6-10 experiments, indicating that the method still has interior design deficiencies. In contrast, the interior design method based on artificial intelligence technology has a concentrated distribution of TBG consideration characteristics in both front-end and end-end experiments, mainly distributed between 15000 ratios and 25000 ratios, and the most uniform distribution of TBG consideration characteristics in the number of experiments of 6-8 times. This indicates that the interior design method based on artificial intelligence technology has high reliability under this experimental parameter.

3.2 Visual saturation

In interior design, items with a high degree of saturation are often positioned in the front by default in a picture of the same hue. An increase in saturation often causes an increase in the intensity of visual impact, and the corresponding three-dimensional visual perception is enhanced. The results of comparing three design methods for interior design saturation experiments are shown in Figure 6.

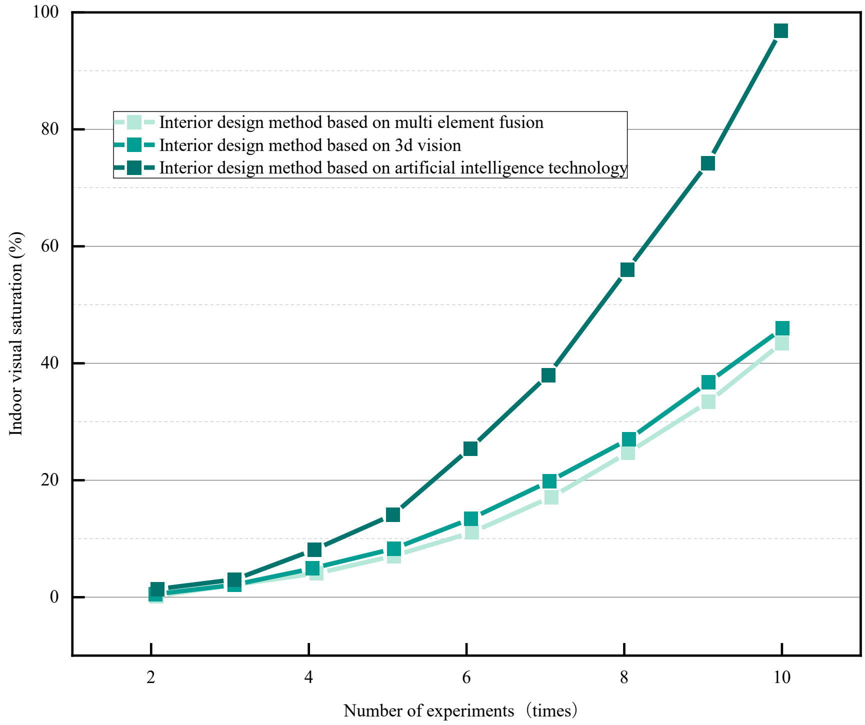


Figure 6. Indoor visual saturation comparison results

As seen from Figure 6, the visual saturation of all three interior design methods changes with the increase in the number of experiments. The visual saturation growth of both the 3D vision-based interior design method and the multi-element fusion-based interior design method is relatively flat, reaching the highest values of 43% and 42% of visual saturation at the 10th number of experiments, respectively, both of which cannot meet the interior design requirements. In contrast, the visual saturation of the interior design method based on artificial intelligence technology began to grow significantly when the number of experiments reached the fourth time and reached the highest value of 98% at the number of experiments 10 times, which can fully meet the requirements of interior design and achieve the comfort standard of indoor life and living.

3.3 Stereo image design level

The left and right viewpoint maps contain a large amount of similar information, and the binocular parallax is most clearly expressed at the object's edges. Therefore, the design level of the stereo image is an important indicator for calculating the absolute difference between the original image and the distorted image in terms of left and right viewpoints. By comparing the visual impact, image contrast, and stereo modeling degree of the three design methods, the level of stereo image design for interior design can be derived. The comparison results of the stereo image design level are shown in Figure 7.

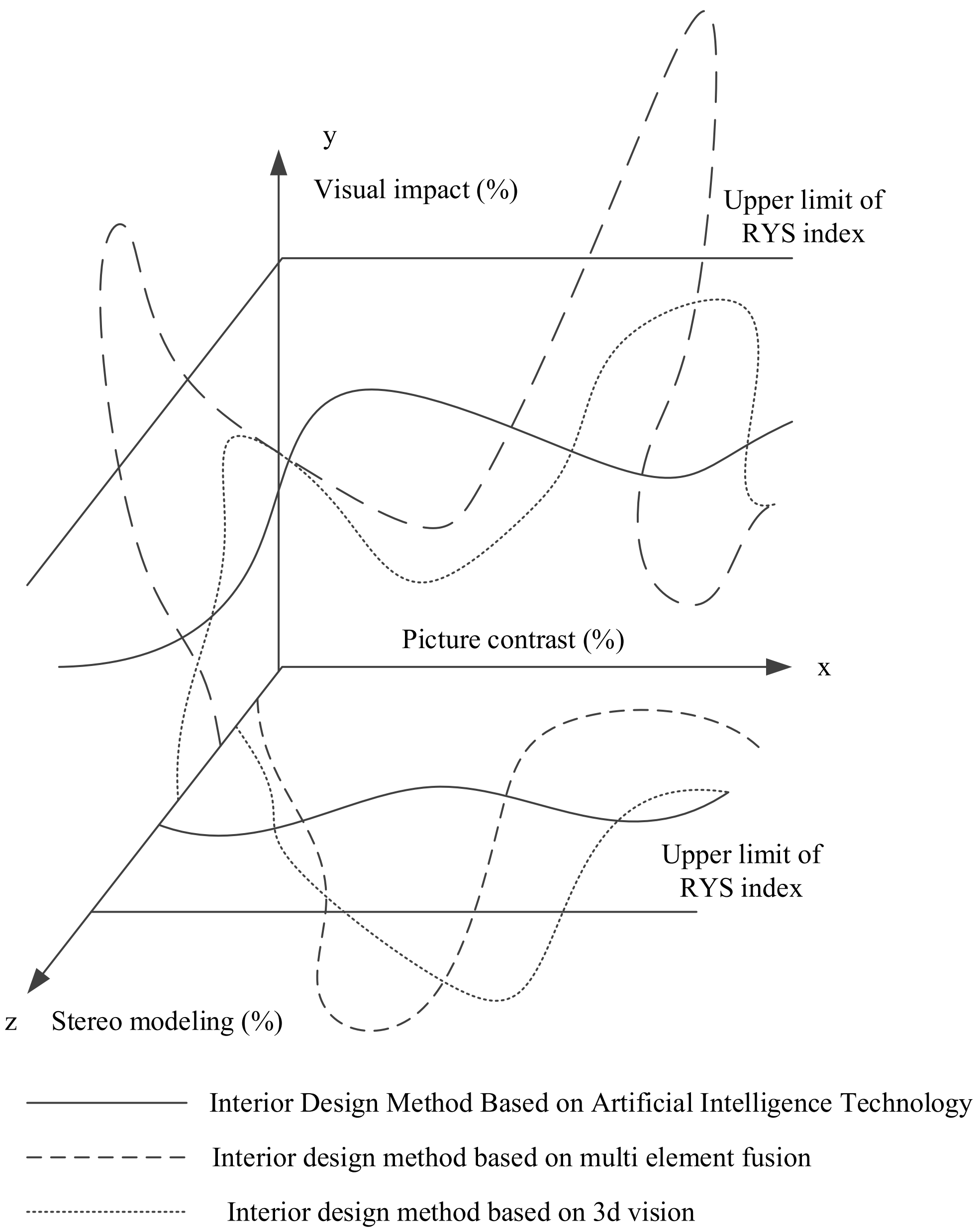
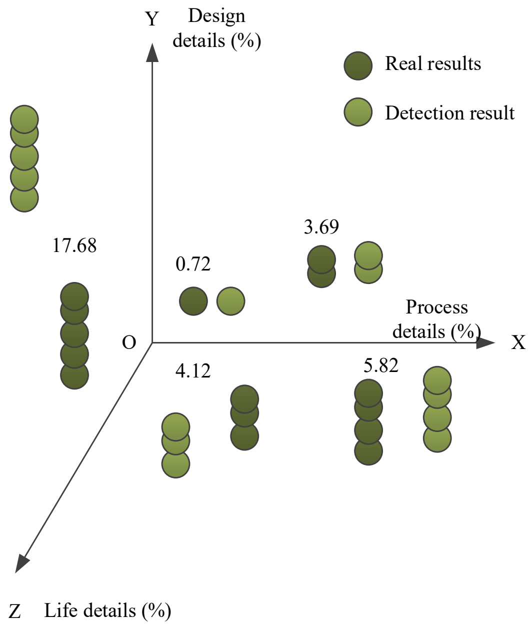


Figure 7. Comparison results of stereo image design level

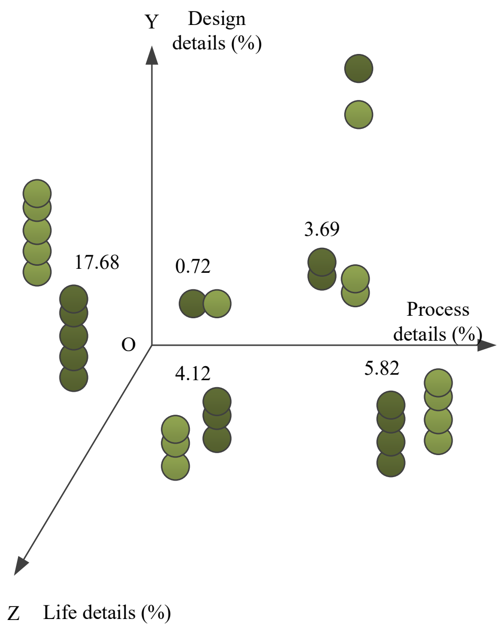
As can be seen from Figure 7, the interior design method based on 3D vision has a picture contrast of about 46.72%, a visual impact of 53.69%, and a three-dimensional modeling degree of 64.18%. The picture contrast of the interior design method based on multi-element fusion is about 41.95%, the visual impact is 65.78%, and the three-dimensional modeling degree is 59.62%. The contrast of the interior design method based on artificial intelligence technology is about 85.58%, the visual impact is 79.69%, and the three-dimensional modeling degree is 86.54%. The comprehensive calculation shows that the level of three-dimensional image design for the interior design method based on 3D vision is about 64.38%, the level of three-dimensional image design for the interior design method based on multi-element fusion is about 67.59%, and the level of three-dimensional image design for the interior design method based on artificial intelligence technology is about 88.51%, which is an increase of 24.13% and 20.92% compared to the two interior design methods. It shows that the method proposed in this paper has the superiority of stereo image design level and has certain generalizability in the field of interior landscape design.

3.4 Spatial reconstruction detection error

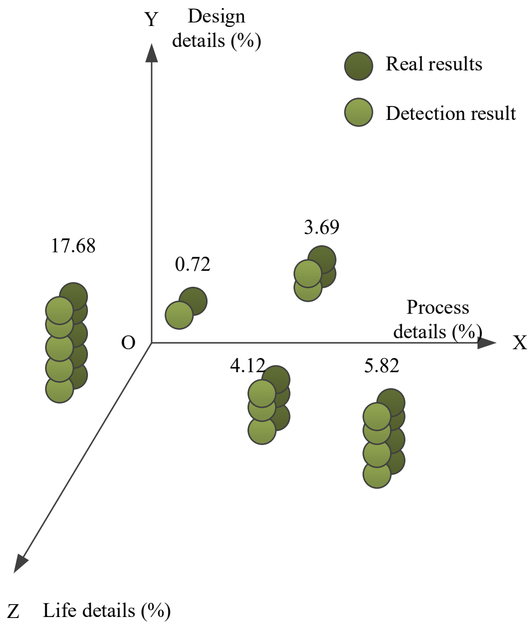
The spatial 3D reconstruction network is mainly developed on synthetic benchmarks, and the rendered images of this dataset consist of isolated, centrally located objects, and the images have no background. Therefore, in the face of real-world objects in different scenes, lighting, and occlusions, the design process is prone to detection errors and fails to achieve satisfactory results. The interior design method based on artificial intelligence technology is compared with two other interior design methods for spatial reconstruction error detection, and the detection results are shown in Figure 8.



(a) 3D vision-based interior design approach



(b) Interior design approach based on multi-element fusion



(c) Interior design methods based on artificial intelligence technology

Figure 8. Indoor spatial reconstruction detection error results

From Figure 8(a), it can be seen that the process details of the 3D vision-based interior design method are 0.72% and 3.69%, and the distance ratios between the real results and the detection results are 0.03 and 0.17, respectively. The design details are 17.68%, and the distance ratio between the real and detection results is 0.49. The life details are 4.12% and 5.82%, and the distance ratios between the real results and the detection results are 0.27 and 0.42, respectively, with an average error result of 0.276. The distance ratios between the real and the detection results were 0.27 and 0.42, respectively, with an average error result of 0.276. This indicates that the process details of the 3D vision-based interior design method have small errors, while the errors of the design details and the living details are larger and do not meet the requirements of spatial reconstruction of interior design.

Figure 8(b) shows that the process details of the multi-element fusion interior design method are 0.72% and 3.69%, and the distance ratios between the real and the detection results are 0.01 and 0.28, respectively. The design details are 17.68%, and the distance ratio between the real and detection results is 0.32. The living details are 4.12% and 5.82%, and the distance ratios between the real and the detection results are 0.23 and 0.35, respectively. Although the multi-element fusion interior design method has smaller detection error results than the 3D vision-based interior design method, the errors of living details and design details still exceed 0.3, and the average error results reach 0.02, which does not meet the spatial reconstruction requirements of interior design.

From Figure 8(c), it can be seen that the interior design method process details based on artificial intelligence technology are 0.72% and 3.69%, and the distance ratios between the real and detection results are 0.013 and 0.01, respectively. The design details are 17.68%, and the distance ratio between the real and detection results is 0.09. the life details are 4.12% and 5.82%. The distance ratios between the real results and detection The average error result of this design method is 0.06, which is about 3.5 times smaller than the error of the other two design methods. The distance between the error results in design and living details is reduced to less than 0.1, avoiding nearly 98% of the error distribution. It shows that the interior space designed by using the interior design method based on artificial intelligence technology can be simulated dynamically without much error between the results and the real space.

4 Conclusion

In this paper, based on artificial intelligence technology, a three-dimensional reconstruction of the interior space planning scene is carried out from the perspective of three-dimensional virtual intelligent design. In the design development process, an interior design method based on artificial intelligence technology is proposed, and the design effect of the method is verified in the process of experimentation. The experimental conclusions are as follows:

1) The interior design method based on artificial intelligence technology has a concentrated distribution of TBG consideration characteristics in both front-end and end-end experiments, mainly distributed between 15,000 ratios and 25,000 ratios, and the most uniform distribution of TBG consideration characteristics at the number of experiments of 6-8 times. This indicates that the method has high design reliability and helps enhance the interior design's effect.

2) In terms of visual saturation, the highest values for the interior design method based on 3D vision and the interior design method based on multi-element fusion were 43% and 42%, respectively, which could not meet the requirements of interior design. In contrast, the highest value of saturation of the interior design method based on artificial intelligence technology reached 98%, which can fully meet the requirements of interior design and achieve the standard of comfort of indoor living and living.

3) The three-dimensional image design level of the interior design method based on artificial intelligence technology is about 88.51%, and the average error result between the real and the detection results is 0.06. It proves that the three-dimensional image design level and the error avoidance effect of the method proposed in this paper are significantly better than the other two design methods, and it has certain generalizability in the field of interior design.

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