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# Construction of Visual Perception Models and Assessment of Aesthetic Effects of Interior Design from the Perspective of Aesthetic Education

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**Abstract** Interior design under the perspective of aesthetic education tends to favour the application of four elements: functional composition, natural landscape, aesthetic atmosphere and humanistic environment. The visual perception model designed in this paper can discriminate the visual salience of design elements in interior graphic design from the perspective of aesthetic education in terms of form, colour and texture. The aesthetic effect assessment model used to reduce the influence of subjectivity was constructed using hierarchical analysis and grey correlation analysis. The results of practical application show that 35 professional designers rated the interior space designed based on the model as 'good', which indicates that the model in this paper can be used to design the interior space from the perspective of aesthetic education at a high level.

**Index Terms** visual salience, hierarchical analysis, grey correlation analysis, visual perception model, interior design

## I. Introduction

In recent years, with the continuous development of China's economic construction and the deepening of reform and opening up, people's material and spiritual life has been significantly improved. At the same time, the construction industry is also rising rapidly, the real estate industry is more and more prosperous. The fierce competition in society and fast-paced pace of life, people want a warm 'harbour' to moor the tired body and mind, so many people have put their energy into the emotional resonance of interior design [1]-[4]. Interior design is a human-centred art that allows people to feel a sense of comfort and leisure atmosphere. In interior design, visual perception plays a crucial role and is the basis for the creation and presentation of interior space [5]-[7].

The process of visual perception is the process by which the human brain transforms light stimuli entering the eyes into an overall experience. It can be divided into three stages which are: attribute classification, prediction and emotional response. Attribute classification involves simplifying and refining the information received according to the highest organising principle that can be found in experience [8]-[10]. Affective response involves how each stimulus affects people's emotions, or predicting the response produced by the stimulus. When an environmental or behavioural stimulus arises as expected, and the relevant associations established through existing experiences within the 'memory of experience' are confirmed, a positive emotional response is usually observed [11]-[14]. Visual perception theory suggests that the first need of a person in space is to be aware of the environment, i.e., to orientate oneself spatially and to have comprehensive information about the environment [15]. The second aspect of psychological needs emphasises the sense of wholeness and order in the various structural relationships in the environment, which shows that interior design in line with visual perception is aesthetic art in line with the aesthetic perspective and has a certain degree of aesthetic value [16]-[19].

Studying the interior design requirements of four design elements, namely, natural landscape, functional layout, aesthetic atmosphere and humanistic environment, from the perspective of aesthetic education, a visual perception model is constructed, which contains the visual prominence of three design elements, namely, form, colour and texture. The constructed aesthetic effect assessment model uses hierarchical analysis and grey correlation analysis to determine the weights of the indicators, conducts reliability tests on the indicators and their weights, and constructs reliability coefficients to reduce the influence of subjective factors on the evaluation results. Through empirical analysis, the aesthetic effect level of the interior space designed based on the visual perception model is determined, and it is verified whether the model can design an interior space design with aesthetic value.

# II. Visual perception modelling from the perspective of aesthetic education

## *II. A. Visual perception*

Visual perception is the first of the five sensory functions of the human body: sight, hearing, smell, taste, touch, etc. It is the most direct sensory experience, which enables people to distinguish the light and darkness of objects, and to identify the shape, colour and texture of objects through their eyes. Vision is not only a tool to adapt to the environment for survival, but also has a sensory function and a means of thinking and communication to assist survival. Therefore, interior design will be unique form, colour and texture used in space, through the human body's visual perception, to create an indoor space environment in line with the changing times and people's aesthetic needs.

## *II. B. Interior Design Needs from the Perspective of Aesthetic Education*

The environmental design of indoor space under the perspective of aesthetic education needs to continuously optimise the quality of natural landscape, functional layout, aesthetic atmosphere and humanistic environment in indoor space [20]. The design needs of indoor space under the perspective of aesthetic education are shown in Figure 1.

(1) Design influence of natural landscape

Natural beauty is the source of all beauty, and landscape scenery has the most real attraction to human beings. When human beings are integrated into nature, they can continuously improve their creativity, imagination and appreciation. Humans prefer to look at novel and complex objects, and an interior space full of natural beauty will enable us to better perceive nature, life, and emotions. Natural environments such as birds in the woods, dewdrops on leaves, rough bark, beautiful flowers and undulating meadows can shape human's sense of beauty and ability. Thus, the design of indoor space should give full consideration to and make reasonable use of the natural environment, so that the landscape design can fully display the beauty of nature.

(2) Design influence of functional composition

Functional composition of indoor space is closely related to the demand for a good material environment and the enhancement of aesthetic ability. The occupants can get the feeling of beauty and inspiration from the indoor space, and when the material environment of the indoor space can meet the aesthetic needs of the occupants, they will be willing to stop and rest in the indoor space. Therefore, the design of indoor space under the perspective of aesthetic education should try to satisfy the demand for beauty and the need for a good material environment. The implementation of aesthetic education is a process of continuous interaction, feedback and enrichment with the spatial environment. In the indoor functional arrangement, the openness and complexity of space should be fully considered, so that the occupants and the surrounding environment form an organic interactive relationship.

(3) The design influence of aesthetic atmosphere creation

Aesthetic education can be through the emotional infection of the space mood of the occupants of the emotion to produce the value of inculcation and education. The most direct way of aesthetic education is to observe, perceive and appreciate the indoor material culture and things through the five senses of the aesthetic subject, through the creation and imagination, so that the occupants are immersed in the aesthetic atmosphere of the indoor space, and the occupants will get apocalyptic ecstasy, so that the sense of belonging and sense of acquisition is enhanced, and then the aesthetic ability is also improved. Therefore, the design of indoor space to create an aesthetic atmosphere, to consider the combination of soft and hard environments on the emotional impact of the occupants, pay attention to the interpretation of the beauty of the spatial environment, so that the entire indoor space becomes an aesthetic atmosphere field.

(4) Design influence of humanistic environment

The environment can shape people, and the beautiful indoor environment is a kind of power, which influences the physical and mental development of the occupants without words, washes the occupants' mind, standardizes the occupants' words and behaviors, and enhances the aesthetic ability of the occupants. On the contrary, the aesthetic ability and cognitive sense in dirty and poor indoor space are reduced. Therefore, indoor space design should be integrated into the spirit of Chinese aesthetic education, excellent traditional culture, unique regional culture and other resources, so that the indoor environment not only has the “external beauty”, but also has the “internal beauty” of culture, enlightenment of the wisdom of the occupants, moisturize the occupants' heart, cultivate the occupants' beautiful words and deeds. It enlightens the wisdom of the residents, nourishes their hearts, and cultivates their beautiful words and behaviors.

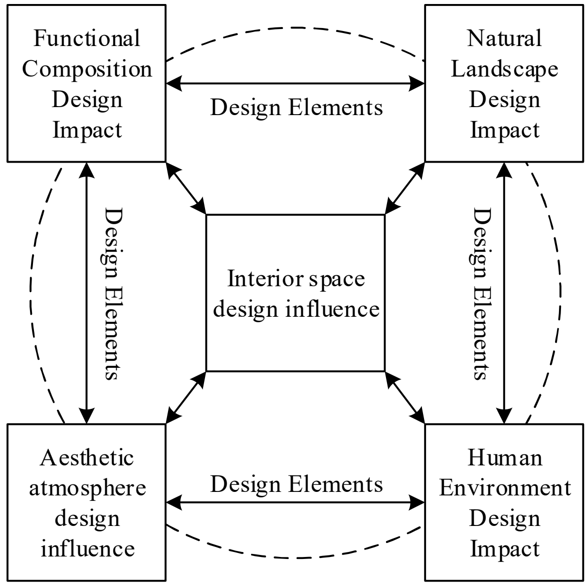


Figure 1: Design requirements of indoor space under the Angle of aesthetic education

### *II. C. Visual perception model construction*

The visual perception model helps one to understand the importance of visual saliency of design elements in interior graphic design from an aesthetic perspective in terms of form, colour and texture. In automatic layout work, the prediction of visual saliency requires that the input and output images are consistent in terms of pixels and size. The output image is reduced to the same size as the input image using down-sampling followed by up-sampling. Full convolutional neural network is used for modelling visual saliency prediction [21]. The full convolutional neural network is based on the modification of traditional deep neural network and the model is implemented based on VGG16.

The text area is a rectangular region that should preferably not overlap with a complete and significant design element and should avoid creating discontinuous text, resulting in a more harmonious visual effect. Therefore, in order to obtain a more accurate segmentation region and clear boundaries, a hybrid function is used in this paper as shown in Equation (1):

$$L(\Theta)=L_B(\Theta)+L_S(\Theta) \tag{1}$$

where $L_B(\Theta)$ denotes the BCEWith Logits Loss function and $\Theta$ is the parameter of the model as shown in equation (2):

$$L_B(\Theta)=-\frac{1}{n}\sum_{i=1}^{n}\left(Q_i\log p_i-(1-Q_i)\log(1-p_i)\right) \tag{2}$$

In Equation (2), $Q_i$ is the visual saliency prediction result for each pixel $p$, $p_i$ is the predicted output of the full convolutional neural network, and $Q_i\in[0,1]$, where 1 represents the highest visual saliency and 0 represents the lowest visual saliency.

$L_S(\Theta)$ represents the SSIMLoss function as shown in Equation (3):

$$L_S(\Theta)=1-\frac{(2\mu_x\mu_y+C_1)(2\sigma_{xy}+C_2)}{(\mu_x^2+\mu_y^2+C_1)(\sigma_x^2+\sigma_y^2+C_2)} \tag{3}$$

In Eq. (3), $x=\{x_p|p=1,2,\cdots,n\}$, $y=\{y_p|p=1,2,\cdots,n\}$ are the two corresponding image blocks extracted from $Q_i$ and $p_i$, $\mu_x$, $\mu_y$, and $\sigma_x^2$, $\sigma_y$ are the mean and variance of $x$ and $y$, respectively, and $\sigma_{xy}$ is their covariance, where $C_1=0.01^2$ and $C_2=0.03^2$ are scalar constants (taken empirically).

The model was further evaluated by using the test set in the GDI graphic design dataset (containing 181 graphic design images and corresponding hot zone maps of visual saliency prediction results) to test and compare the visual saliency prediction of this paper with the SALI-CON model as well as the other three models, and five evaluation metrics were used: the statistical metrics linear correlation (CC), relative entropy (KL), normalised scanpath saliency (NSS), area under the ROC curve (AUC), and similarity (SIM), which are used to measure pixel-wise correlation between two distributions. index (CC), relative entropy (KL), normalised scan path significance (NSS), area under the ROC curve (AUC) and similarity (SIM).The magnitude of the CC value represents the degree of proximity of the two distributions, with larger values representing closer proximity, and the formula is shown in Eq. (4):

$$CC(P,Q)=\frac{\frac{1}{n}\sum_{i=1}^{n}(p_i-\bar{p})(Q_i-\bar{Q})}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(p_i-\bar{p})^2}\sqrt{\frac{1}{n}\sum_{i=1}^{n}(Q_i-\bar{Q})^2}} \tag{4}$$

$P$ represents the image where the comparison was performed, here the hot zone map generated by the model where the comparison was performed. $Q$ represents the Ground Truth hot zone map from the GDI test set. The calculation of $\bar{P}$ as well as $\bar{Q}$ in Eq. is shown in Eq. (5):

$$\begin{cases}\bar{P}=\frac{1}{n}\sum_{i=1}^{n}p_i\\ \bar{Q}=\frac{1}{n}\sum_{i=1}^{n}Q_i\end{cases} \tag{5}$$

The value of CC ranges from -1 to 1. A value of 1 indicates that the two comparison images are the same and the distribution has the highest correlation.

$KL$ is between the two distributions, a measure of the predictive ability of the model.Ground Truth is the hot zone map in the GDI dataset, using the hot zone map as an example of Ground Truth, the value of a pixel is defined as a measure of the visual saliency of that pixel, $KL$ highly penalises false predictions, the smaller the value, the better the predictive ability, and when $KL(P,Q)=0$, it means that the two contrasting images are the same, and its formula as shown in Equation (6):

$$KL(P,Q)=\sum_{i=1}^{n}(Q_i\log Q_i-Q_i\log p_i)=L(P,Q)-H(Q) \tag{6}$$

$L(P,Q)$ represents the visual significance prediction results of the model and the cross entropy of the Ground Truth heat zone map, calculated as shown in Equation (7):

$$L(P,Q)=-\sum_{i=1}^{n}(Q_i\log p_i) \tag{7}$$

In Equation (6), $H(Q)$ represents the cross-entropy of the Ground Truth hot zone map as shown in Equation (8):

$$H(Q)=-\sum_{i=1}^{n}(Q_i\log Q_i) \tag{8}$$

## III. Assessment of aesthetic effects

### *III. A. Construction of the indicator system*

The study assesses the aesthetic effect of the interior space designed based on the perspective of aesthetic education, and establishes a multilevel evaluation index system as shown in Table 1. This paper proposes the layered modelling idea of ‘object understanding layer - feature perception layer - metrics layer’, defining the structure of the two-layer index system and the evaluation metrics layer [22]. Adopting the cluster test, we take the seven major categories of understanding objects, namely, morphology, colour, texture, natural landscape, functional composition, aesthetic atmosphere, and humanistic environment as the first-level indexes, the second layer of perceptual elements as the second-level indexes, and the metrics layer adopts the fifth-order Likert metrics method.

Table 1: Interior design evaluation index system

| Primary indicator | Secondary indicator |
|---|---|
| Form (X1) | Clear area (X11) |
| | Compact structure (X12) |
| | Layout equilibrium (X13) |
| | Logical function (X14) |
| Colour (X2) | Overall style coordination (X21) |
| | Key information highlights (X22) |
| | Color specification is consistent (X23) |
| | Color conforms to cognitive habits (X24) |
| Texture (X3) | Material selection (X31) |
| | Optical design (X32) |
| | Home and decoration (X33) |
| | Technical application (X34) |
| Natural landscape (X4) | Natural plant (X41) |
| | Waterscape design (X42) |
| | Landscape item (X43) |
| Functional composition (X5) | Multi-functional layout (X51) |
| | Spatial coordination (X52) |
| | Enhanced space boundary elasticity (X53) |
| Aesthetic atmosphere (X6) | Optimize spatial color (X61) |
| | Pay attention to material texture (X62) |
| | Enhanced design of light source (X63) |
| | Eliminate noise design (X64) |
| | Appropriate white design (X65) |
| Humanistic environment (X7) | Spatial culture infiltration (X71) |
| | Space energy catalysis (X72) |
| | Carrying information (X73) |

## *III. B. Aesthetic effect assessment model construction*

### III. B. 1) Process of establishing the weights of the first-level indicators

(1) Create a two-by-two comparison analysis matrix. Define the comparison analysis matrix for the $k$ st rater as $A\left(k=1,2,\cdots,m\right)$, as shown in equation (9):

$$A=\left(a_{ij}^{k}\right)=\begin{bmatrix} a_{11}^{k} & a_{12}^{k} & \cdots & a_{1m}^{k} \\ a_{21}^{k} & a_{22}^{k} & \cdots & a_{2m}^{k} \\ \vdots & \vdots & & \vdots \\ a_{n1}^{k} & a_{n2}^{k} & \cdots & a_{nm}^{k} \end{bmatrix} \tag{9}$$

where, $a_{ij}^{k}$ is the judgement value of the relative importance of the $i$ rd element and the $j$ th element in the same level given by the $k$ nd judge.

(2) Determination of initial weights. The two-by-two comparative analysis matrix $A$ can be expressed as the characteristic root $A_k$ and the corresponding eigenvector $\lambda_k$, and the weight of the index is found according to the eigenvector corresponding to the largest characteristic root of the matrix, as shown in equation (10):

$$A_kP_k=\lambda_kP_k \tag{10}$$

First of all, the largest eigenroot of matrix $A_k$ corresponding to the eigenvector $P_{km}$, standardised eigenvector of the largest eigenroot for the $k$ rd judge to the weight vector of each indicator, as shown in equation (11). This weight vector value is calculated based on the subjective scoring of the judges, so the reliability of matrix $A_k$ for the test, if it does not meet the reliability requirements, that is, the weight vector is invalid, it is necessary to reestablish the two-by-two comparative analysis of the matrix has been to meet the requirements of the degree of reliability:

$$W_k' = \left(w_{k1}', w_{k2}', \cdots, w_{kn}'\right) \tag{11}$$

(3) Construction of reliability matrix. Define $E' = \left\{E_1', E_2', \cdots, E_m'\right\}$ as the set of judging experts, $P' = \left\{P_1', P_2', \cdots, P_n'\right\}$ as the set of judging indicators, and the values of the indicator parameters assigned by different judges $E_k'$ to different judging indicators $P_i'$ are $a_{ki} = w_{ki}\left(i = 1, 2, \cdots; n; k = 1, 2, \cdots, m\right)$ to get the reliability evaluation matrix, as shown in equation (12):

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{21} & \cdots & a_{2m} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \tag{12}$$

### III. B. 2) Creation of reliability factors

(1) Standardised treatment. In order to reduce the influence of random factors and solve the comparability problem caused by different data outlines, the evaluation matrix was standardised by means of homogenisation, as shown in equation (13):

$$A_{ki}' = a_{ki} \Big/ \sum_{k=1}^{m} a_{ki} \tag{13}$$

(2) Constructing a reference sequence. In order to measure the degree of dispersion of the evaluation results of each expert, a reference sequence $A_0'$ is constructed based on the average of the evaluation results, as shown in equations (14) and (15):

$$A_0' = \left(a_{01}', a_{02}', \cdots, a_{0n}'\right) \tag{14}$$

$$a_{0i}' = \frac{1}{m}\sum_{k=1}^{m} a_{ki}' \tag{15}$$

(3) Obtain the grey correlation degree. According to the theory of hierarchical analysis method (AHP), the grey correlation coefficient between each expert's empirical judgment of the importance of each indicator and the reference value is shown in equation (16), and the established correlation coefficient matrix is shown in equation (17):

$$\xi_{0k} = \frac{\min_k \min_j \left|A_{0i}' - A_{ki}'\right| + \rho \max_k \max_j \left|A_{0i}' - A_{ki}'\right|}{\left|A_{0i}' - A_{ki}'\right| + \rho \max_k \max_j \left|A_{0i}' - A_{ki}'\right|} \tag{16}$$

$$\xi = \begin{bmatrix} \xi_{11} & \xi_{12} & \cdots & \xi_{1n} \\ \xi_{21} & \xi_{21} & \cdots & \xi_{2n} \\ \vdots & \vdots & & \vdots \\ \xi_{m1} & \xi_{m2} & \cdots & \xi_{mn} \end{bmatrix} \tag{17}$$

where, $\rho \in [0,1]$ is the resolution coefficient, usually taken as $\rho = 0.5$.

In order to compare and analyse the evaluation results more easily, the grey correlation is used to characterize the degree of correlation between the scoring sequences and the reference sequences shown in Eq. (18), and the larger the degree of correlation indicates that the results of the experts' judgments are closer to the reference mean value, and the degree of dispersion of the judgment results is smaller [23]:

$$r_{0k} = \frac{1}{n}\sum_{i=1}^{n} \xi_{ki} \tag{18}$$

(4) Determination of the reliability factor. Definition 1: The degree of relevance of the evaluation results given by the rater is the rater's reliability, which reflects the extent to which the rater has had a role in the entire process of

evaluation. Definition 2: The reliability coefficient is a quantitative description of the magnitude of validity of the rater's evaluation results and is defined as $\delta$.

Using the degree of association to reflect the degree of reliability of the evaluation results given by the evaluator, the reliability coefficient of the evaluation results given by the evaluator is constructed, and the reliability coefficient of the $k$ nd evaluating expert can be expressed as follows:

$$\delta_k = r_{0k} \Big/ \sum_{k=1}^{m} r_{0k} \tag{19}$$

The size of the reliability coefficient reflects the magnitude of the role of the expert in the evaluation process and the degree of consistency of the results of the evaluation, which is a quantitative description of the psychological evaluation of human cognition, and the matrix of reliability coefficients by $m$ expert is shown in equation (20):

$$\delta = (b_k) 1 \times m = [b_1, b_2, \cdots, b_m] \tag{20}$$

#### III. B. 3) Establishment of composite correction weights for Tier 1 indicators

The reliability coefficient is used to correct the weights of the indicators calculated by AHP method, and the corrected composite weight coefficient is recorded as $W = B \times A$, and the composite weight vector of each evaluation indicator is expressed as $W = (W_1, W_2, \cdots, W_n)$.

When the judge makes different evaluation results, the degree of correction of the reliability coefficient is often different, which precisely proves that the reliability coefficient relies on the evaluation results themselves to reflect the size of the judge's reliability, and has a high degree of objectivity.

#### III. B. 4) Evaluation modelling

Using the same method to establish the secondary indicator system and weights, the aesthetic effect assessment model as shown in equation (21) can be constructed:

$$\begin{gathered} S_v = \sum_{i=1}^{n} W_i X_i = \sum_{i=1}^{n} \sum_{j=1}^{m} W_i w_j x_{ij} \\ X_i = \sum_{i=1}^{n} \sum_{j=1}^{m} w_{ij} x_{ij} \\ (i = 1, 2, \cdots, n; j = 1, 2, \cdots, m) \end{gathered} \tag{21}$$

where $S_v$ is the composite score of the aesthetic effect of visual elements. $X_i$ is the primary evaluation indicator. $x_{ij}$ is the second-level indicator. $W_i$ is the weight of the first-level indicators. $w_{ij}$ is the weight of the second-level indicators.

## IV. Empirical analyses

### *IV. A. Visual Attention Detection Experiment*

#### IV. A. 1) Training process

The datasets used for training and testing are from the GDI graphic design dataset, of which 70 were selected for training and the remaining 15 for testing in the experiment. In the training set, a small portion of images was used as a validation set to avoid overfitting during training. Data generated from head movements and eye movements were used, which contained gaze maps generated from the corresponding scan paths. The experiment uses a sliding viewport method to randomly rotate the viewport angle of all panoramas and project them into 20,000 2D image blocks. This data expansion strategy allows experiments with only a few dozen complete panoramic images to still train the network. In addition, the data (panoramic images and their saliency maps) were normalised by subtracting the mean of the pixels and dividing by the standard deviation, thus rescaling the data to the [-1,1] interval. The human eye focus map did not require normalisation as its pixel values contained only the values 0 and 1. All images and saliency maps were scaled to a resolution of 320×240. The experiments started with a base learning rate of $7 \times 10^{-7}$ and then the network was trained for 50 rounds using an adaptive moment estimation method (Adam) with a batch size of 8. For preventing overfitting, the experiments use a weight decay strategy.

#### IV. A. 2) Comparison of different loss functions

The experiments tested the effect of different loss functions on the model and were trained under the same conditions. The training results of the different loss functions were averaged and compared as shown in Figure 2.The experiment tried five possible combinations. They consisted of one or several evaluation metrics. When a metric is used as a loss function, it may affect the test results evaluated by other metrics. For example, when CC was used as a loss function only, the KL metric performed poorly during the test. In addition, when a metric is used as a loss function, it may itself perform poorly in significance assessment. For example, training with the KL results was not very good, where the values of KL were higher than those trained with other metrics. Experiments showed that training with KL-CC-NSS as the loss function gave the best results, with AUC, NSS, CC, SIM, and KL of 0.835, 1.44, 0.763, 0.777, and 0.636, respectively.

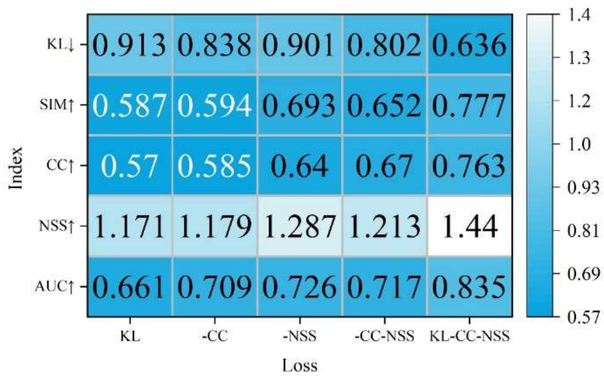


Figure 2: Training results of different loss functions

#### IV. A. 3) Performance comparison of different models

For performance comparison, all methods are executed on the test set. The results of this paper's model and the other models in terms of these five metrics are shown in Fig. 3. It can be observed that the proposed neural network model consistently outperforms the other models in all the metrics considered, with AUC, NSS, CC, SIM, and KL of 0.897, 1.41, 0.78, 0.877, and 0.643, respectively. In contrast, this paper's method can more accurately predict the saliency graphs about the design elements of the aesthetic education.

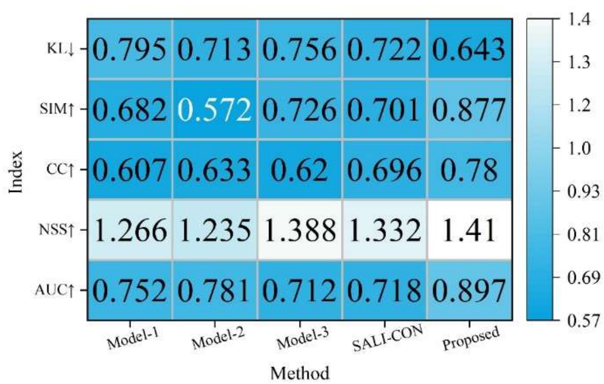


Figure 3: Comparison of different models

### *IV. B. Assessment of aesthetic effects*

A study was conducted to evaluate the interior design of an interior space designed based on a visual perception model. The design was evaluated using the aesthetic effect assessment model. A total of 35 questionnaires were distributed in the form of a questionnaire to 35 professional interior designers. The aesthetic effect level scale was set as (very poor, poor, fair, good, very good).

#### IV. B. 1) Scoring of indicators

The questionnaires were collected and counted to obtain the number of questionnaires for each rating separately, which was used as the initial judgement matrix. The details are shown in Table 2. The number of people who rated each indicator as poor is zero.

Table 2: The interior space design evaluates the initial judgment matrix

| Primary indicator | Secondary indicator | Very bad | Worse | General | Good | Very good |
|---|---|---|---|---|---|---|
| X1 | X11 | 0 | 1 | 3 | 16 | 15 |
| | X12 | 0 | 2 | 1 | 19 | 13 |
| | X13 | 0 | 1 | 2 | 18 | 14 |
| | X14 | 0 | 1 | 1 | 16 | 17 |
| X2 | X21 | 0 | 2 | 1 | 19 | 13 |
| | X22 | 0 | 1 | 2 | 18 | 14 |
| | X23 | 0 | 1 | 1 | 17 | 16 |
| | X24 | 0 | 1 | 3 | 19 | 12 |
| X3 | X31 | 0 | 1 | 1 | 16 | 17 |
| | X32 | 0 | 2 | 2 | 19 | 12 |
| | X33 | 0 | 1 | 1 | 18 | 15 |
| | X34 | 0 | 1 | 1 | 16 | 17 |
| X4 | X41 | 0 | 1 | 2 | 16 | 16 |
| | X42 | 0 | 2 | 1 | 19 | 13 |
| | X43 | 0 | 1 | 2 | 18 | 14 |
| X5 | X51 | 0 | 1 | 1 | 16 | 17 |
| | X52 | 0 | 1 | 1 | 19 | 14 |
| | X53 | 0 | 1 | 2 | 18 | 14 |
| X6 | X61 | 0 | 2 | 1 | 17 | 15 |
| | X62 | 0 | 1 | 1 | 19 | 14 |
| | X63 | 0 | 1 | 2 | 16 | 16 |
| | X64 | 0 | 2 | 1 | 16 | 16 |
| | X65 | 0 | 1 | 1 | 19 | 14 |
| X7 | X71 | 0 | 1 | 1 | 18 | 15 |
| | X72 | 0 | 1 | 2 | 17 | 15 |
| | X73 | 0 | 2 | 1 | 19 | 13 |

The normalized matrix is shown in Table 3. 35 professional interior designers gave the largest percentage of “very good” ratings.

Table 3: The interior space design evaluation standardization matrix

| Primary indicator | Secondary indicator | Very bad | Worse | General | Good | Very good |
|---|---|---|---|---|---|---|
| X1 | X11 | 0 | 0.029 | 0.086 | 0.457 | 0.429 |
| | X12 | 0 | 0.057 | 0.029 | 0.543 | 0.371 |
| | X13 | 0 | 0.029 | 0.057 | 0.514 | 0.4 |
| | X14 | 0 | 0.029 | 0.029 | 0.457 | 0.486 |
| X2 | X21 | 0 | 0.057 | 0.029 | 0.543 | 0.371 |
| | X22 | 0 | 0.029 | 0.057 | 0.514 | 0.4 |
| | X23 | 0 | 0.029 | 0.029 | 0.486 | 0.457 |
| | X24 | 0 | 0.029 | 0.086 | 0.543 | 0.343 |
| X3 | X31 | 0 | 0.029 | 0.029 | 0.457 | 0.486 |
| | X32 | 0 | 0.057 | 0.057 | 0.543 | 0.343 |
| | X33 | 0 | 0.029 | 0.029 | 0.514 | 0.429 |
| | X34 | 0 | 0.029 | 0.029 | 0.457 | 0.486 |
| X4 | X41 | 0 | 0.029 | 0.057 | 0.457 | 0.457 |
| | X42 | 0 | 0.057 | 0.029 | 0.543 | 0.371 |
| | X43 | 0 | 0.029 | 0.057 | 0.514 | 0.4 |
| X5 | X51 | 0 | 0.029 | 0.029 | 0.457 | 0.486 |
| | X52 | 0 | 0.029 | 0.029 | 0.543 | 0.4 |
| | X53 | 0 | 0.029 | 0.057 | 0.514 | 0.4 |
| X6 | X61 | 0 | 0.057 | 0.029 | 0.486 | 0.429 |
| | X62 | 0 | 0.029 | 0.029 | 0.543 | 0.4 |
| | X63 | 0 | 0.029 | 0.057 | 0.457 | 0.457 |
| | X64 | 0 | 0.057 | 0.029 | 0.457 | 0.457 |
| | X65 | 0 | 0.029 | 0.029 | 0.543 | 0.4 |
| X7 | X71 | 0 | 0.029 | 0.029 | 0.514 | 0.429 |
| | X72 | 0 | 0.029 | 0.057 | 0.486 | 0.429 |
| | X73 | 0 | 0.057 | 0.029 | 0.543 | 0.371 |

#### IV. B. 2) Calculation of indicator weights

Using the aesthetic effect assessment model constructed in this paper, the weights of the indicators are shown in Table 4. The weight of "texture" among the first-level indicators is the largest, reaching 15.1%. The relative weight of the largest proportion of natural plants (X41), indicating that the arrangement of natural plants in interior design under the perspective of aesthetic education has the greatest influence on the aesthetic effect.

Table 4: Index weight

| Primary indicator | $W_i$ | Secondary indicator | $Rw_{ij}$ | $w_{ij}$ |
|---|---|---|---|---|
| X1 | 0.136 | X11 | 0.251 | 0.0341 |
| | | X12 | 0.226 | 0.0308 |
| | | X13 | 0.189 | 0.0257 |
| | | X14 | 0.334 | 0.0454 |
| X2 | 0.145 | X21 | 0.32 | 0.0464 |
| | | X22 | 0.185 | 0.0268 |
| | | X23 | 0.214 | 0.0311 |
| | | X24 | 0.281 | 0.0407 |
| X3 | 0.151 | X31 | 0.268 | 0.0405 |
| | | X32 | 0.217 | 0.0328 |
| | | X33 | 0.321 | 0.0485 |
| | | X34 | 0.194 | 0.0293 |
| X4 | 0.144 | X41 | 0.396 | 0.057 |
| | | X42 | 0.332 | 0.0478 |
| | | X43 | 0.272 | 0.0392 |
| X5 | 0.14 | X51 | 0.268 | 0.0375 |
| | | X52 | 0.347 | 0.0486 |
| | | X53 | 0.385 | 0.0539 |
| X6 | 0.139 | X61 | 0.21 | 0.0292 |
| | | X62 | 0.14 | 0.0195 |
| | | X63 | 0.172 | 0.0239 |
| | | X64 | 0.221 | 0.0307 |
| | | X65 | 0.257 | 0.0357 |
| X7 | 0.145 | X71 | 0.301 | 0.0436 |
| | | X72 | 0.336 | 0.0487 |
| | | X73 | 0.363 | 0.0526 |

#### IV. B. 3) Assessment of results

According to the formula (21), $S_v = [0, 0.0365, 0.0418, 0.5041, 0.4177]$. According to the principle of maximum affiliation, 0.5041>0.4177>0.0418>0.0365>0, so the aesthetic effect of the interior space designed based on the visual perception model is rated as "good", which means that the overall level of the interior design has been praised by the designers. This means that the overall level of the interior design is unanimously praised by the designers.

## V. Conclusion

This paper constructs a visual perception model that can identify the visual salience of design elements in interior graphic design from the perspective of aesthetic education. The aesthetic effect of the interior space using the visual perception model is evaluated through the constructed interior design aesthetic evaluation index system and aesthetic effect assessment model. The aesthetic effect of visual elements given by 35 professional interior designers was rated as $S_v = [0, 0.0365, 0.0418, 0.5041, 0.4177]$, and according to the principle of maximum affiliation, the aesthetic effect of the interior space designed using the visual perception model was rated as "good". The visual perception model constructed in this paper can design interior spaces with aesthetic value.

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