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Virtual Reality in Chinese Modern Video Art and Cultural Design Application

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ABSTRACT

With the rapid development of virtual reality technology, its application in the field of art and design is attracting increasing attention. Based on the perspective of user demand, the article combines the Kano model to analyze user satisfaction with virtual reality technology used in modern Chinese image culture design, and finds that its landing point is the desired attribute in the first quadrant, with the Better and Worse coefficients of 0.531 and -0.141, respectively, which indicates that users expect the application of virtual reality technology in the design of image art and culture. Then the evaluation index system of VR image art and culture design is constructed, and the principal component analysis method is used to assign weights and establish the quantitative model of VR image art and culture design. The analysis shows that the weight of the sensory level is the largest 0.3780, and users attach great importance to the aesthetic experience (0.3780) and emotional experience (0.2710) of VR image art and culture design. The application of virtual reality can draw on the results of the quantitative model to design optimization strategies, combine traditional and modern elements, use the interactivity of VR to enhance artistic expression, create an immersive experience, and create more in-depth and original works of video art and culture.

Keywords: virtual reality, Kano model, principal component analysis, quantitative model, evaluation index system, video art and culture design

1. Introduction

The rapid progress of science and technology has made video art an indispensable existence in people's daily life, and has delicately and profoundly outlined the colorful picture of contemporary society and culture with its unique charm and far-reaching influence. The diverse forms of video art have enriched and expanded people's cultural horizons [1-3]. The multiplicity and complexity of contemporary society and culture provide video art with a fertile ground for creation and a broad

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space for expression [4]. Through the window of video art, we are able to see all aspects of contemporary society and culture, including the hidden contradictions and conflicts, as well as people's diverse living conditions and emotional world [5-6]. Video art is actively shaping contemporary social culture, creating new cultural symbols and phenomena that are quietly changing people's values and aesthetic standards, and its widespread dissemination and promotion, but also to promote the exchange and integration of different cultures [7-8]. However, the interaction between video art and contemporary society and culture is not a straight path, and faces many difficult challenges and problems [9]. Therefore, in-depth investigation of the interaction between video art and contemporary society and culture not only helps us to understand the evolution of contemporary society and culture more thoroughly, but also promotes the innovation and development of video art, and facilitates the formation of a benign interactive cycle between the two [10-11].

Virtual reality, as a kind of emerging content with art as its ontology and technology as its support, has been an important development field of digital media art innovation in China, and also an object of contemporary new media culture research. The emergence of virtual reality images has brought new challenges to the theoretical system of image language and new propositions for the study of image language [12-14]. Virtual reality image is a kind of image, and image art production belongs to the category of art production, governed by the universal law of production, but also has its own relatively unique characteristics and content [15]. There are all kinds of commonalities between virtual reality images and traditional images in the production, circulation and consumption links, as well as differentiated new contents and connotations, so as to realize the development of the language of images in the way of artistic production [16].

In this paper, we collect the user needs of virtual reality applied to the design of modern Chinese image art and culture through questionnaire survey, and construct a two-dimensional attribute table using Kano model to classify the functional characteristics of the needs. The Better-Worse coefficient is calculated to determine the functional fallout quadrant. After that, the evaluation index system of VR image art and culture design is constructed, covering the three dimensions of sensory level, interaction level and reflection level. After collecting questionnaire data from different groups of people in an art center, the weights of the evaluation indexes are calculated using principal component analysis to form a quantitative model of VR image art and culture design. Finally, based on the degree of influence of each index on VR image art and culture design, the corresponding virtual technology application strategy is designed, and the application of virtual reality technology in image art design is explored from the remaining dimensions.

2. VR applied to video art and cultural design

With the rapid development of virtual reality (VR) technology and the wide application of multimedia interactive technology, the means of expression of modern Chinese video art and cultural design have been expanded and redefined the relationship between art creation and audience experience. Among them, the integration of virtual reality technology provides artists with brand-new creative tools and expression methods.

Virtual interaction through the use of computer vision technology to simulate the generation of virtual three-dimensional space environment, the use of projection display technology to be presented, and through the three-dimensional dynamic visual landscape and system simulation of the environment set up so that the audience immersed in the environment, resulting in a fantasy dynamic interactive experience. With the deepening of the use of digital images in live performance, as well as the audience's perception and aesthetic concepts of the enhancement of the form of live tourism performances are also constantly innovating to attract the audience's involvement, whether from the image of the screen, the form of expression or the mode of viewing the performance are more in pursuit of interactive immersive sensory experience.

VR technology not only broadens the physical and visual boundaries of art, but also challenges the traditional concept of art creation and appreciation. The creation process of artworks is transformed from manual operation to programming and algorithm-driven, which makes the creation results far more complex and delicate than traditional methods. In addition, the application of VR technology has promoted the transformation of the concept of modern video art from a two-dimensional, static expression to a multi-dimensional, dynamic experience. Artists utilize VR technology to create an immersive art experience, where the audience is no longer just a passive appreciator, but is able to interact with the modern video artwork and become part of the experience. This transformation of the art form enriches the means and content of artistic expression, and deepens the connection between art and the audience. The application of VR technology in artistic creation marks a new understanding of the nature and function of art, and opens up a new field of artistic exploration and innovation.

3. VR image art based on user needs

Satisfaction is the feeling of happiness or disappointment that users have after comparing the effect of product use with their expectations. Based on the user satisfaction survey, this chapter combines the KANO model to investigate the demand for virtual reality technology to be integrated into the design of modern Chinese video art and culture.

3.1. KANO model

The Kano model is a structural analysis method that calculates the relationship between the degree of availability of each feature of a product and user satisfaction, and is a useful tool for categorizing and ranking the importance of user requirements. The Kano model categorizes various attributes that are related to user satisfaction, and there are the following five categories of attributes: essential attributes, desired attributes, appealing attributes, non-differentiating attributes, and inverse attributes.

3.1.1. Quality attributes. The five quality attributes of the Kano model are shown in Figure 1. The horizontal coordinate represents the degree of availability of a requirement, with the higher the degree of availability to the right and the lower the degree of availability to the left. The vertical coordinate represents the user's satisfaction, where up represents a high level of user satisfaction and down represents a low level of user satisfaction. Different requirements correspond to different levels of user satisfaction, and the relationship between each requirement type and user satisfaction is also different.

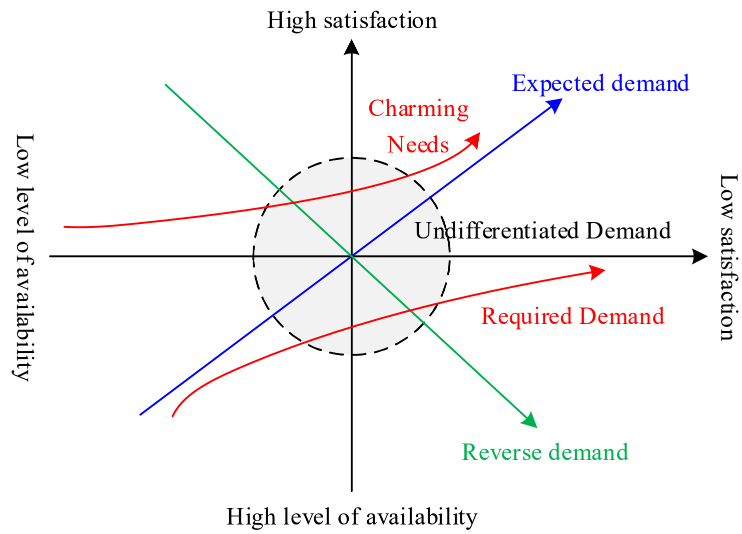

Fig. 1. Five germplasm properties of the Kano model

1) Must-have attributes (M). Attributes that users believe must be present in a certain product. When the product does not have this attribute, users will feel very dissatisfied. But when the product has this attribute, the user will feel that this is supposed to be the function that should be there, and the user satisfaction will not change.
2) Expected Attributes (O). User satisfaction is directly proportional to the number of desired attributes, and an increase in desired attributes will bring about an increase in user satisfaction. If the desired attributes are not met, user satisfaction will decrease significantly.
3) Attractive attribute (A). This attribute will surprise the user, and this type of attribute will surprise the user. The charm attribute can significantly increase user satisfaction and users will not feel lost when this product lacks the charm attribute. The charm attribute is closely related to the innovativeness of the product development process.
4) Undifferentiated Attributes (I). The no-difference attribute has no effect on the user's experience. Whether the product has this attribute or not, the user will not have a change in the feeling of use.
5) Reverse Attribute (R). Reverse attribute means that the user's satisfaction with such requirement items is inversely proportional to the degree of availability. When the product provides such requirement items, the user's satisfaction not only does not increase, but also feels obviously dissatisfied, which makes the user's experience feel worse. Users would prefer not to have such requirement items to make the product easier and smoother to use.

3.1.2. Calculation of demand item weights. The Kano model is able to categorize product functional attributes and then identify the relationship between functional attributes and user satisfaction. The research method is divided into the following five steps:
1) Identify the functional requirement items of users using the product through multiple user research methods.
2) Design a Kano questionnaire based on the sorted out functional requirement items.
3) Distribute and collect Kano questionnaires.
4) Count the results of the Kano questionnaire and categorize the requirements.
5) Categorize each requirement item according to the Kano attributes, so as to determine the design method of the function and carry out the design practice.

Kano is widely used in categorizing user requirement items, and the model is a qualitative research method. If there are more than one maximum value when using the method of taking the maximum value to determine the attribute category of the requirement item, this situation makes it impossible to determine the Kano attribute of the changed item. In order to avoid this situation, the calculation of the relative user satisfaction coefficient is proposed, which can be used to determine the categorization to which the functionality attribute belongs.

When the product provides this feature, the Better coefficient is calculated as shown in equation (1):

$$Better(Si) = (A+O)/(A+O+M+I) \tag{1}$$

When the product does not provide this feature, the Worse factor is calculated as shown in equation (2):

$$Worse(Di) = (M+O)/(A+O+M+I) \tag{2}$$

A, O, M and I represent the number of functional requirements attributed to categories A, O, M and I respectively. After calculating the Better-Worse coefficients, the results of the coefficient calculations for each functional requirement item are formed into a coordinate diagram to classify the attributes of the requirement item.

3.2. KANO model analysis

3.2.1. Questionnaire distribution. Based on the KANO model user satisfaction, design this VR image art and culture design questionnaire. For the function of the product, two positive and negative questions are used to test, focusing on different points of emphasis, while explaining this function point to ensure that the user can understand and get real and effective data questionnaire. This questionnaire is provided in the form of a single choice matrix to answer. The questionnaire was randomly distributed in an art center, targeting users of different ages and occupations, thus ensuring the authenticity of the data, a total of 174 questionnaires were recovered, of which 141 were valid questionnaires, with an effective recovery rate of 81.03%.

3.2.2. Statistics. The 174 returned questionnaires were cleaned for data, screened for validity, and non-valid response data were removed, and then statistics were calculated according to the KANO model, if there were users who positively answered the questions very much, and negatively answered the questions very much, then the statistics would fall crosswise in the first rightmost grid, and the number would be added to 1, and so on for the statistics of the data, and Table 1 is the data for the questionnaires' two-dimensional attributes. According to the statistical results to calculate the number of users under each possibility as a percentage of the total number of users, Table 2 shows the questionnaire two-dimensional attribute ratio. It can be seen that of the 141 valid questionnaires, the number of people who positively answered very much like and negatively answered very much dislike for the integration of virtual reality technology in the design of modern video art and culture is 14, accounting for 9.93%, and the number of people who positively answered very much dislike and negatively answered very much like is 2, accounting for 1.42%.

Table 1. Two dimensional properties of the questionnaire

		Negative evaluation				
		Very like	It should be	Indifferent	Grudging	Dislike
Positive evaluation	Very like	8	3	33	26	14
	It should be	1	7	9	10	0
	Indifferent	0	1	17	2	0
	Grudging	0	0	4	1	1
	Dislike	2	0	0	0	2

Table 2. The ratio of the two-dimensional properties of the questionnaire

		Negative evaluation				
		Very like	It should be	Indifferent	Grudging	Dislike
Positive evaluation	Very like	5.67%	2.13%	23.40%	18.44%	9.93%
	It should be	0.71%	4.96%	6.38%	7.09%	0.00%
	Indifferent	0.00%	0.71%	12.06%	1.42%	0.00%
	Grudging	0.00%	0.00%	2.84%	0.71%	0.71%
	Dislike	1.42%	0.00%	0.00%	0.00%	1.42%

Based on 141 valid data questionnaires, a total of 6 demand levels were established, and their demand function characteristics were categorized based on a matrix composed of forward and reverse questions. A stands for charm demand, O stands for expectation demand, M stands for basic demand, I stands for non-differentiated demand, R stands for reverse demand, and Q stands for respondents are confused about this function, and the statistical results of various demands are shown in Figure 2. Charm demand, expectation demand, basic demand, no difference demand, reverse demand and doubtful result account for 37.59%, 10.64%, 2.13%, 40.43%, 2.13% and 7.09% respectively.

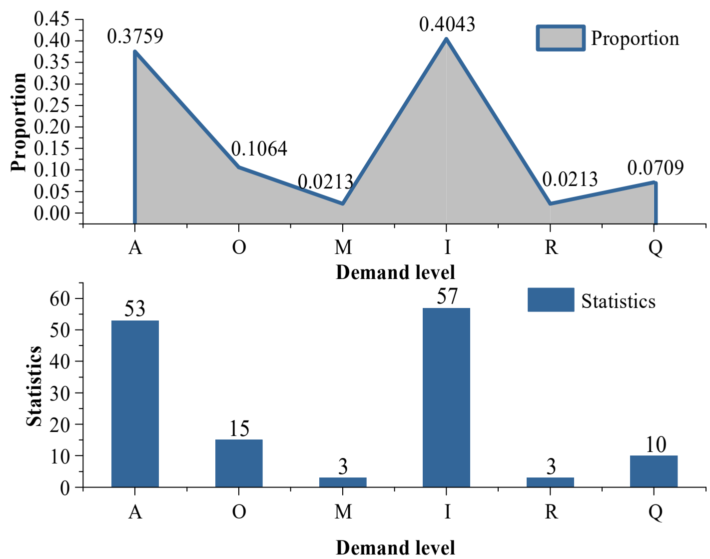

Fig. 2. Statistical results of various requirements

3.2.3. Functional fallout quadrant. Based on the percentage of the six demand attributes derived from the above data, the Better-Worse formula is used to obtain their corresponding Better-Worse coefficients, with the Better coefficient being 0.531 and the Worse coefficient being -0.141. Based on the resulting Better-Worse coefficient values, the scatterplot is divided into four quadrants, with the functional dropout quadrant as shown in Fig. 3. This function falls in the desired attribute of the first quadrant, which occurs when the Better coefficient value is high and the absolute value of the Worse coefficient is also high, and when the product provides this function, the user satisfaction will increase, and when it does not provide this function, the user satisfaction will decrease. Therefore, users have a greater degree of demand for the integration of virtual reality technology into the design of Chinese modern video art and culture, and designers should try their best to meet the users' expectation-type needs.

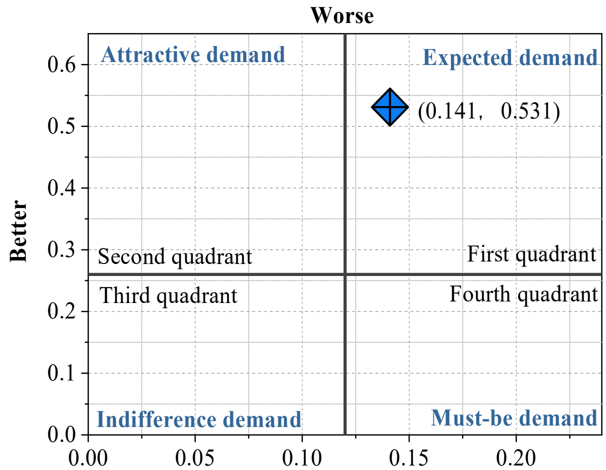

Fig. 3. Functional drop quadrant

4. Quantitative analysis of the cultural design of VR video art

This topic will elaborate on the construction of evaluation indexes of VR image art and culture design, and determine their weights using principal component analysis, quantitatively analyze users' experience of VR image art and culture design, and thus propose strategies for the application of virtual technology in China's modern image art and culture design.

4.1. System of evaluation indicators

Taking the instinctive layer, behavioral layer and reflective layer of human brain activity as the theoretical basis, the user experience evaluation dimensions of VR image art and culture design are thus summarized. Through the screening and modification of the indexes, the evaluation indexes of VR image art and culture design are finally determined from the sensory level, interaction level and reflection level, and the user experience evaluation index system is shown in Table 3, which includes 5 first-level indexes and 19 second-level indexes.

Table 3. User experience evaluation index system

Dimension	Primary index	Secondary index
Sensory level	Aesthetic experience A1	Pattern B1
		Colour B2
		Text B3
		Icon B4
		Layout B5
Interaction level	Interactive experience A2	Real time B6
		Universality B7
		Fluency B8
	Immersive experience A3	Visual enrichment B9
		Action immersion B10
		Motor relation B11
		Photofilm cooperation B12
Reflective level	Emotional experience A4	Novelty B13
		Sense of discovery B14
		Satisfaction B15
		Personalization B16

		Kindred B17
	Cultural experience A5	Cultural content B18
		Cultural content B19

4.2. Principal Component Analysis

Principal Component Analysis (PCA) is a multivariate statistical analysis method that utilizes the idea of dimensionality reduction to transform multiple indicators into a small number of unrelated composite indicators. From a mathematical point of view, it is a dimensionality reduction processing technique.

The usual method is to select the number of variables less than the original variables, but these selected variables can explain most of the variables in the information, will be such a variable as the new variables, i.e., principal components, and through the principal components of the variables to explain the information of the composite indicators. It can be seen that principal component analysis is actually a method that can effectively reduce the dimensionality of the variables. It uses an orthogonal transformation of a matrix to transform the original vector related to the components into a new random vector that is not related to its components, which simplifies the complex system problem into an easy-to-operate mathematical problem, thus achieving the purpose of simplifying the problem.

4.2.1. Analytical principles. Assume that there is n sample with a total of p variables per sample, which together form a matrix of order $n \times p$:

$$A=\begin{bmatrix} x_{11} & x_{12} & \dots & x_{1p} \\ x_{21} & x_{22} & \dots & x_{2p} \\ \dots & \dots & \dots & \dots \\ x_{n1} & x_{n2} & \dots & x_{\varphi p} \end{bmatrix} \tag{3}$$

When p is large, it is more troublesome to examine the problem in p-dimensional space. In order to overcome this difficulty, it is necessary to carry out a dimensionality reduction process, that is, to replace the original larger number of variable indicators with fewer composite indicators, and to make these fewer composite indicators reflect as much as possible the information reflected by the original larger number of variable indicators, while at the same time they are independent of each other.

Principal component analysis is defined by noting $x_1, x_2, \cdots, x_p$ as the original variable indicator and $z_1, z_2, \cdots, z_n \left(m \leq p\right)$ as the new variable indicator:

$$\begin{cases} Z_1 = l_{11}x_1 + l_{12}x_2 + \ldots + l_{1p}x_p \\ Z_2 = l_{21}x_1 + l_{22}x_2 + \ldots + l_{2p}x_p \\ \vdots \\ Z_m = l_{m1}x_1 + l_{m2}x_2 + \ldots + l_{mp}x_p \end{cases} \tag{4}$$

The coefficient l_{ij} is determined on the principle that:

1) z_i and $z_j \left(i \neq j; i, j = 1, 2, \cdots, m\right)$ are independent of each other.

2) z_i is the largest variance of all linear combinations of $x_1, x_2, \cdots, x_p$, and z_2 is the largest variance of all linear combinations of $x_1, x_2, \cdots, x_p$ that are uncorrelated with z_1. ...... z_n is the largest variance among all linear combinations of $x_1, x_2, \cdots x_p$ that are uncorrelated with $z_1, z_2, \cdots\cdots, z_{m-1}$. Then the new variable indicator $z_1, z_2, \cdots, z_n$ is called the first, second, ..., and m th principal components of the original variable indicator $x_1, x_2, \cdots, x_p$, respectively.

4.2.2. Modeling. In this paper, we will establish the evaluation model of VR image art and culture design according to the following steps:

1) Collect the original data required in the index system and calculate the matrix of correlation coefficients:

According to the above analysis can be seen, PCA is actually to determine the original variable $x_j\left(j=1,2,\cdots,p\right)$ on the principal components $z_i\left(i=1,2,\cdots,m\right)$ loadings $l_{ij}\left(i=1,2,\cdots,m;j=1,2,\cdots,p\right)$:

$$R=\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1p} \\ r_{21} & r_{22} & \cdots & r_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ r_{p1} & r_{p2} & \cdots & r_{pp} \end{bmatrix} \tag{5}$$

Normalization is carried out, i.e., $r_{ij}\left(i,j=1,2,\cdots,p\right)$ is the correlation coefficient between the original variables x_i and x_j, $r_{ij}=r_{ji}$, which is calculated by the formula:

2) Calculate the eigenvalues and eigenvectors:

$$r_{ij}=\frac{\sum_{k=1}^{n}\left(x_{ki}-\overline{x}_i\right)\left(x_{ki}-\overline{x}_j\right)}{\sqrt{\sum_{k=1}^{n}\left(x_{ki}-\overline{x}_i\right)^2\sum_{k=1}^{n}\left(x_{kj}-\overline{x}_j\right)^2}} \tag{6}$$

The eigenvalues of the matrix of correlation coefficients R are computed with $\lambda_1\geq\lambda_2\geq\ldots\geq\lambda_n\geq0$, which corresponds to the eigenvectors $\mu_1,\mu_2,\ldots,\mu_m$, where $\mu_j=\left[\mu_{1j},\mu_{2j},\ldots,\mu_{mj}\right]^T$, from the eigenvectors, m new indicator variables are formed:

$$\begin{aligned} y_1 &= \mu_{11}\overline{x}_1+\mu_{21}\overline{x}_2+\ldots+\mu_{m1}\overline{x}_m \\ y_2 &= \mu_{12}\overline{x}_1+\mu_{22}\overline{x}_2+\ldots+\mu_{m2}\overline{x}_m \\ &\cdots \\ y_m &= \mu_{1m}\overline{x}_1+\mu_{2m}\overline{x}_2+\ldots+\mu_{mm}\overline{x}_m \end{aligned} \tag{7}$$

Where, y_1 is the first principal component, y_2 is the second principal component, ..., y_m is the m th principal component.

3) Select $p\left(p\leq m\right)$ principal components and calculate the principal component contribution rate and cumulative contribution rate:

The information contribution rate and cumulative contribution rate of λ_j are calculated and called:

$$b_j=\frac{\lambda_j}{\sum_{k=1}^{m}\lambda_k}, j=\left(1,2,\ldots,m\right) \tag{8}$$

The information contribution of principal component y_i, meanwhile, has:

$$a_p=\frac{\sum_{k=1}^{p}\lambda_k}{\sum_{k=1}^{m}\lambda_k} \tag{9}$$

The cumulative contribution rate of principal component $y_l,y_2,\cdots y_p$. When a_p is close to 1 (generally taking the value of 0.75, 0.80, 0.90), the first p indicator variables $y_1,y_2,\cdots y_p$ are selected as p principal components, replacing the original m indicator variables, which in turn can be analyzed comprehensively for the p principal components.

4) Calculate the composite score:

$$Z=\sum_{j=1}^{p} b_b y_i \tag{10}$$

Where b_j is the information contribution rate of the j nd principal component, which is analyzed according to the comprehensive score value situation.

5) According to the final result of the sample VR image art and culture design of each principal component score and comprehensive score situation, its specific situation is analyzed and evaluated.

4.3. Calculation of indicator weights

The content of the questionnaire is based on the evaluation index system of VR image art and cultural design in 4.1, and the questionnaire form uses the "Likert 5-level scale". Set the scoring target to five levels: "very unimportant", "not important", "neutral", "important", and "very important", and assign values of 1, 2, 3, 4, and 5 respectively. The study was conducted through an online questionnaire and was distributed to four groups: artists, learners, researchers, and temporary visitors. A total of 385 questionnaires were distributed, 362 were recovered, and a total of 362 valid questionnaires were collected, with an effective sample rate of 94.03%, and the data results were credible.

4.3.1. Calculation process. The process of determining the weights using principal component analysis is: (1) extraction of principal components, (2) calculation of correlation coefficients between the evaluation indexes and the principal components as well as in the whole model, and (3) calculation of the index weights.

The initial eigenvalues and principal components extraction are shown in Table 4. After data analysis, the system extracted 2 principal components, and their variance explanation rates are 60.315% and 15.281%, respectively, with a cumulative variance explanation rate of 75.669%, indicating that the first 2 principal components can reflect most of the information of the 19 indicators.

Table 4. Initial eigenvalue and principal component extraction

Factor	Initial eigenvalue			Principal extraction		
	Feature root	Variance %	Cumulative%	Feature root	Variance %	Cumulative%
F1	5.503	60.315	60.388	5.503	60.315	60.388
F2	1.365	15.281	75.669	1.365	15.281	75.669
F3	0.772	3.373	79.042			

Next, we analyze the information extraction of the principal components for the evaluation indexes, as well as the correspondence between the principal components and the evaluation indexes. After calculation, the results of factor loading coefficient analysis are shown in Table 5. The value of “common degree” is higher than 0.45, which means that the correlation between the evaluation indexes and the principal component is large, and the principal component is effective.

Table 5. Factor loading coefficient analysis

Index	Factor load factor		Common degree
	Main component 1	Main component 2	
Pattern B1	0.685	0.321	0.776
Colour B2	0.671	0.452	0.542

Text B3	0.547	0.586	0.695
Icon B4	0.632	0.456	0.782
Layout B5	0.646	0.331	0.516
Real time B6	0.557	-0.188	0.548
Universality B7	0.576	-0.284	0.581
Fluency B8	0.672	-0.188	0.777
Visual enrichment B9	0.571	-0.189	0.722
Action immersion B10	0.758	-0.165	0.453
Motor relation B11	0.709	-0.249	0.502
Photofilm cooperation B12	0.619	-0.211	0.735
Novelty B13	0.745	-0.188	0.725
Sense of discovery B14	0.644	-0.241	0.546
Satisfaction B15	0.814	-0.208	0.524
Personalization B16	0.807	-0.262	0.473
Kindred B17	0.668	-0.086	0.537
Cultural content B18	0.544	-0.223	0.613
Cultural content B19	0.763	-0.205	0.662

4.3.2. Calculations. After calculating the correlation coefficients between the evaluation indicators and the principal components, according to the identified weight values of each evaluation indicator of user experience, calculate the weight values of the evaluation indicators under each dimension, and based on the results of the calculations, finally establish the quantitative model of VR image art and culture design.

1) Analysis of evaluation indicators. The results of the weights of the indicators at the sensory level, interaction level, and reflection level are shown in Figures 4~6 respectively. You can get the weight of each evaluation indicator under each dimension. Taking the sensory level as an example, the weights of the five second-level evaluation indicators in this dimension are 0.0780, 0.0814, 0.0610, 0.0790 and 0.0786, respectively, indicating that the importance of "text B3" and "pattern B1" indicators in this dimension is slightly lower than that of "color B2", "symbol B4" and "layout B5", indicating that these two indicators are not hard indicators to improve the aesthetic experience of VR image art and cultural design. Among the five level 1 indicators, the weights of aesthetic experience, interactive experience, immersion experience, emotional experience and cultural experience are 0.3780, 0.0750, 0.1979, 0.2710 and 0.0781, respectively.

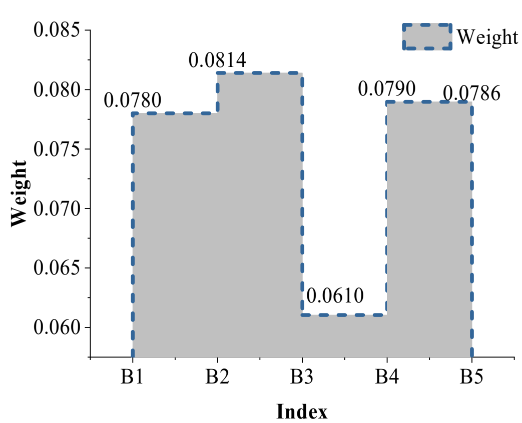

Fig. 4. Sensory level indicator weight

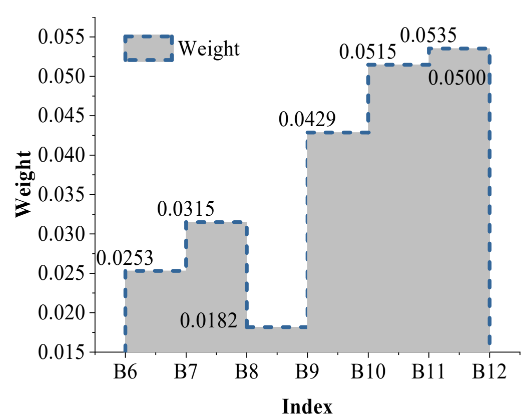

Fig. 5. Interaction level indicator weight

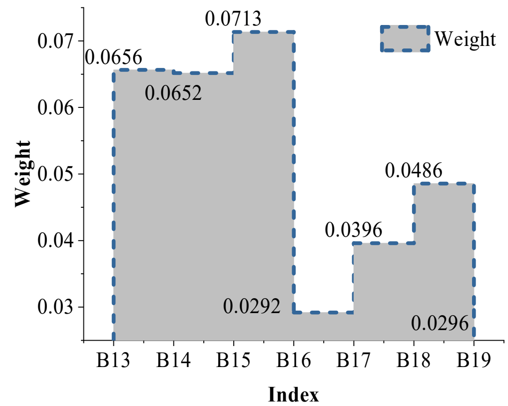

Fig. 6. Reflective level indicator weight

2) Comparison of evaluation dimensions. The three evaluation dimensions of VR image art and cultural design are weighted as follows: sensory level (0.3780) > reflective level (0.3491) > interactive level (0.2729), which reflects the high demands users have for modern image art and cultural design under virtual technology in terms of the 'sensory level'.

4.4. Application of VR in Film and Television Art and Design

4.4.1. Based on user experience. Certain guiding principles and design strategies are needed when developing and designing or optimizing modern video art. Based on the above quantitative model of VR video art and cultural design, the following user experience design strategies are proposed in order of priority:

1) Sensory level. The visual design of VR image art and culture design, from text, icons, pictures, colors to interface layout, should be consistent with the theme of art and culture, and be concise and orderly, focused and flexible in form.

2) Reflection level. In terms of content selection, it should be based on its original content and the activity itself, and be able to visualize and concretely reflect the process itself of skills, operations, performances and so on. In addition to text, photos, audio and video, CG animation and modeling performance can also be utilized. Show users modern art and culture in an interesting way, reflecting the advantages of virtual reality technology, and enhancing the user's interest in use and intimacy.

3) Interaction level. Motion relations bring immersive experience to users. The design of the motion immersion aspect can simulate the real behavior in the interaction behavior. Sound coordination and visual enrichment require the creation of environments with NRM elements, as well as the addition of real-world elements such as characters, light, and motion sound effects.

4.4.2. Combining tradition and modernity. The application of virtual reality in modern video art and cultural design should integrate traditional and modern elements. Through the application of virtual reality in art design, the traditional static and limited space art form is transformed into a diversified expression with interactive, interactive and virtual reality functions. This transformation not only makes the artwork more vital, but also gives the audience a richer perceptual experience.

4.4.3. Interactivity enhances artistic expression. The application of virtual reality enhances the interactivity of artistic expression and creates a more profound artistic experience for the audience. Under the guidance of virtual reality technology, artworks are no longer static existences, but can generate a closer relationship with the audience through interactive functions. The audience can participate in the creation and evolution of the artwork by touching, clicking or other means, realizing the real-time interaction between the artwork and the audience. This interactivity runs through the entire art design process, making the audience a part of the art creation and establishing a deep emotional resonance with each other.

4.4.4. Creating immersive experiences. The virtual reality function creates an immersive experience for art design, bringing the viewer into the virtual world of the work and providing a richer and more engaging sensory experience. Through the skillful integration of computer software and hardware, virtual reality technology makes viewers feel as if they are traveling into the scene depicted in the artwork, allowing them to gain an immersive experience that goes beyond traditional viewing.

5. Conclusion

The application of virtual reality breaks the traditional limitations of modern Chinese video art and cultural design, giving the work a sexual dimension of expression. Based on the Kano model, the study investigates the user demand for the application of virtual reality in image art design. A quantitative model of VR image art and culture design is constructed, and the model is analyzed and interpreted by combining the principal component analysis method. The results found that the Better coefficient and Worse coefficient of applying VR technology in image art and culture design are 0.531 and -0.141 respectively, which belong to the expected demand, and the users express high expectations for the integration of VR technology into image art and culture design. The weighting results of the sensory level, interaction level and reflection level are 0.3780, 0.2729 and 0.3491, and the users attach the most importance to the sensory level of VR image art and culture design. The aesthetic experience (0.3780) and emotional experience (0.2710) of the first-level indicators have the most obvious influence on user experience. The constructed quantitative model intuitively shows the degree of influence of each evaluation index on users when they watch VR image art and culture design, which provides certain theoretical guidance for the application of virtual technology in image art and culture design. In addition, the application of virtual reality in modern film and television art and culture design can be realized through the combination of traditional and modern elements, the use of virtual reality interactivity to enhance artistic expression, and the creation of immersive experience in these dimensions.

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