Online Works Display System of Art Design Based on VR Technology and Machine Vision

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Abstract. In order to improve the efficiency of the display effect of art design works, based on VR technology, this paper combines machine vision algorithms to construct an online works display system of art design works, and proposes a sampling algorithm based on nuclear alignment. Moreover, this paper uses kernel alignment to measure whether the sample is significant relative to the training set, and continues to add representative samples to the training set until the selected training set can represent the overall characteristics. In addition, for the art design image, this paper proposes an algorithm for calculating the optimal restored image based on the local linear properties, and combines the needs of art online design works to display the system structure framework, and analyzes its realization process. Finally, this paper designs experiments to study the design effects of art design works and the online display effects of art works, and uses a combination of numbers and graphics to interpret data. The research results show that the model constructed in this paper has certain practical effects.

1   INTRODUCTION

The process of creating three-dimensional art works includes its early design conception and sub-camera drawing, visual element design and three-dimensional dynamic design, post-composition and output [2]. With the continuous upgrading and optimization of Internet technology, my country has entered the 5G era, which means that the era of universal mobile phone ownership has arrived. As the aesthetic life becomes more and more obvious, people are tired of boring text and limited, rigid static pictures. Therefore, dynamic graphics are becoming more and more popular among the public. As a rich and widely used form of visual expression, its impact and appeal on the audience are far greater than static text and graphics. Moreover, its inclusiveness and interactivity are no less

than any other form of visual art [20]. In addition, three-dimensional artwork has many advantages to attract vision. With its unique three-dimensional graphics and rich texture, it can create a wide space effect in the dynamic, so that the vision is no longer limited to two-dimensional planes. Therefore, in the new media environment, three-dimensional artwork design will become the most extensive and potential branch of modern visual art. At the same time, it also meets the needs of contemporary graphic information processing. Through the exploration and application of the expression form of three-dimensional art works, we can give full play to its advantages in design, construct various forms in space and time, and continuously deepen the visual, physiological and psychological impact of the viewer. The beauty of the visual effects of dynamic graphic design comes from the visual elements in the graphic. Therefore, the characteristics and beauty of graphic design in the creation of three-dimensional art works are the parts that should be emphasized in the design. Only by accurately grasping the positioning and concept of the work, and achieving excellent creativity in terms of screen layout, color and fonts, can three-dimensional art works have a strong visual appeal [5].

2   RELATED WORK

The design of art works started earlier in Western countries. With the development of science and technology, the application of art works in many developed countries has matured [3]. Every product of Apple Inc., the application of art works and images, and the information dissemination method of interactive experience all lead the fashion trend. For example, in the Apple advertising "Designed by Apple in California", designers use the design language of artistic works, dynamic text and sound to express dynamic effects. Manvs Machine is a Los Angeles-based motion imaging studio that has cooperated many times with Apple and Nike. Most of their works appear in the form of three-dimensional works of art and have won many awards, including the Black Pencil and Cannes Gold Lions, which are highly sought after by the industry [16]. In terms of theoretical research, literature [8] used critical thinking to combine aesthetic inspiration and design experimentation, which perfectly demonstrates the process of artistic work design from creative conception, mid-term production problem solving to final commercial practice. The literature [23] introduced the core theory and technology of artistic works. Its research focuses on the explanation of the design and production process in the case, and many cases can help designers make plans and quickly implement them in the project. In recent years, the design of art works has also developed rapidly, and the field of application has been further expanded. It has gradually penetrated into all areas of people's lives, and has been widely used in media, TV movie titles, interactive platforms, new media art exhibitions, and H5 [10]. In the classic H5 case, its interesting art works make cultural relics come alive, and better integrate traditional culture with contemporary art, so as to achieve the effect of viral communication and rapid brand value transmission [22]. The design concept of the literature [7] originated from the collision between contemporary art design and traditional Chinese culture. The work uses gray, black and gold as the main colors. The free change of graphics in the space not only retains traditional Chinese elements, but also gives the work a contemporary artistic style. In terms of theoretical research, the literature [6] analyzed and summarized the basic principles and laws of art work design from the aspects of space, time, motion, and audiovisual. The literature [15] defined the concept of artistic works, expounds the influence of technological development on the performance of graphic design and the diversity of visual performance in the design of artistic works. The literature [19] combed the origins of artistic works design from the perspectives of animation ontology, film studies, animation practice and visual communication. Moreover, it explored the connection and difference between animation and graphic design and artwork design, as well as the uniqueness of artwork design and the new supplement that this form brings to aesthetics. With the development of 3D animation technology, 3D special effects technology and 3D phenomenon technology as the background, the literature [4] introduced in detail the huge impact of 3D

technology on the traditional film industry and the structural changes to the entire animation film industry, and elaborated on their characteristics and functions in the industry.

The literature [1] proposed an algorithm for calculating the original image based on minimizing the reconstruction error, and used the steepest gradient descent method to solve it. The algorithm is relatively intuitive and simple, but it does not solve the singular value problem. The literature [12] proposes an improved algorithm to solve the singular value problem. The improved algorithm improves the robustness, but it still adopts the steepest gradient descent method, the time complexity of iterative calculation is high, and it is easy to obtain the local optimal value. The literature [21] proposed to learn the original image by solving the loss function, which avoids the iterative process. The literature [18] proposed to obtain the position of the original image in the original sample space by calculating the distance in the feature space. The algorithm is non-iterative and only involves linear calculation, which eliminates numerical instability and local minimum problems. The literature [9] proposed a method to solve the pre-image problem based on Nyström formula. The literature [17] constructed a set of bases equidistant from the original training sample set, and calculated the original image through the inner product of the new sample and this set of bases. The literature [11] proposed a more stable image restoration algorithm, which uses Tikhonov regularization method in the original sample space and uses Lasso regularization method for sparse reconstruction.

3   IMAGE RESTORATION ALGORITHM IN KERNEL METHOD

For the new sample x, its linear representation in the high-dimensional space is $P_d\phi(x)$, and then $P_d\phi(x)$ is used to calculate its optimal preimage.

We assume that $X = \{x_1, x_2, \cdots, x_N\} \subset R^n$ is the training set for KPCA, x is the test sample, and $\phi(x)$ is the corresponding vector in the feature space F. $P_d\phi(x)$ represents the linear projection of $\phi(x)$ on the training sample set in the feature space, and K represents the kernel matrix of the kernel function k corresponding to X.

An image restoration algorithm based on KPCA is proposed, and the approximate restoration image is calculated by minimizing the function in the formula. We set[14]:

$$\rho(z) = \left\| \phi(z) - P_d\phi(x) \right\|^2 \tag{1}$$

Among them, $z \in R^n$, $\rho(z)$ represents the residual amount in the feature space. From the continuity of the nonlinear mapping $\phi(x)$, it can be seen that two points that are very close in the feature space are also relatively close in the original sample space. By arranging the right end of $\rho(z)$, the following formula is obtained:

$$\min_{z \in R^n} \rho(z) = \min_{z \in R^n} \left\{ k(z,z) - 2\sum_{j=1}^{N} \omega_j \sum_{i=1}^{N} \alpha_i^j k(z, x_i + \Omega) \right\} \tag{2}$$

Among them,

$$\omega_j = \sum_{i=1}^{N} \alpha_{i=1}^{N} k(x, x_i) \tag{3}$$

Ω is a constant.

When the kernel function adopts the Gaussian function $k(x,z) = \exp\left(-\|x-z\|^2/(2\delta^2)\right)$, the optimization problem of the above formula is transformed into:

$$\min_{z \in R^n} \rho(z) = 1 - \max_{z \in R^n} 2 \sum_{j=1}^{N} \omega_j \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|x-z\|^2/2\sigma^2\right) + \Omega \tag{4}$$

We set the gradient of $\rho(z)$ with respect to z equal to 0, that is

$$\nabla_z \rho(z) =$$
$$\frac{1}{\sigma^2} \sum_{j=1}^{N} \omega_j \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|z-x_i\|^2/2\sigma^2\right)(z-x_i) = 0 \tag{5}$$

The iterative equation for z is obtained:

$$z = \frac{\sum_{j=1}^{N} \omega_j \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|z-x_i\|^2/2\sigma^2\right) x_i}{\sum_{j=1}^{N} \omega_j \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|z-x_i\|^2/2\sigma^2\right)} \tag{6}$$

The fixed-point iterative algorithm is used to calculate the approximate original image z of sample x after removing the noise, and the iterative format used is:

$$\omega_j(t) = \sum_{i=1}^{N} \alpha_i^j k\left(\tilde{x}(t), x_i\right) \tag{7}$$

$$z(t) = \frac{\sum_{j=1}^{N} \omega_j(t) \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|\tilde{x}(t)-x_i\|^2/2\sigma^2\right) x_i}{\sum_{j=1}^{N} \omega_j(t) \sum_{i=1}^{N} \alpha_i^j \exp\left(-\|\tilde{x}(t)-x_i\|^2/2\sigma^2\right)} \tag{8}$$

Among them,

$$\tilde{x}(t) = \begin{cases} x & t = 0 \\ z(t-1) & t > 0 \end{cases} \tag{9}$$

For the new sample x, we set $\phi(x)$ to be the corresponding vector in the feature space F. $P_d \phi(x)$ is the projection of $\phi(x)$ to the principal component in the feature space. Calculating the q nearest neighbors of $P_d \phi(x)$ in the feature space F is more accurate than directly calculating the q nearest neighbors of the noisy sample x in the original sample space. In the section, we use $x^1, x^2, \cdots, x^q$ to denote the q nearest neighbors of the test sample x obtained by calculation.

On the assumption that the sample distribution satisfies local linearity, $P_d \phi(x)$ can be expressed linearly by its q nearest neighbors. Therefore, we set the pre-image of the test sample x as:

$$x^* = \sum_{i=1}^{q} t_i x^i$$

(10)

It can be expressed linearly by its q nearest neighbors. We set the pre-image of the test sample x as $X^q = \left[x^1, x^2, \cdots, x^q \right]$ and set $t = \left[t_1, t_2, \cdots, t_q \right]'$. The pre-image x^* is calculated through the following optimization problem:

$$\min_{t \in R^q} J\left(t_1, t_2, \cdots, t_q\right) = \min_{t \in R^q} \left\| \phi\left(\sum_{i=1}^{q} t_i x^i \right) - P_d \phi(x) \right\|^2$$

(11)

The radial basis function satisfies that for any sample x, $k(x,x)$ is a constant. Then, the optimization problem can be transformed into the maximization problem in the following formula[13]:

$$\max_{t \in R^q} J\left(t_1, t_2, \cdots, t_q\right) = \max_{t \in R^q} \left(\phi\left(\sum_{i=1}^{q} t_i x^i \right), \ P_d \phi(x) \right)$$
$$= \max_{t \in R^q} \left(\phi\left(\sum_{i=1}^{q} t_i x^i \right), \sum_{\ell=1}^{N} w_\ell \phi(x_\ell) \right)$$
$$= \max_{t \in R^q} \left(\sum_{\ell=1}^{N} w_\ell k\left(\sum_{i=1}^{q} t_i x^i, x_\ell \right) \right)$$

(12)

Among them,

$$w_\ell = \sum_{j=1}^{d} \sum_{i=1}^{N} \alpha_i^j k(x_i, x) \alpha_\ell^j$$

(13)

If we set the derivative $t_r \left(r = 1, 2, \cdots, q\right)$ of J at dJ/dt_r to 0, we get the following result:

$$\frac{dJ}{dt_r} = -\sum_{\ell=1}^{N} w_\ell k\left(\sum_{i=1}^{q} t_i x^i, x_\ell \right)(x^r)'$$
$$\left(\left(\sum_{i=1}^{q} t_i x^i - x_\ell \right) \Big/ \sigma^2 \right) = 0$$

(14)

$\beta_\ell = w_\ell k\left(\sum_{i=1}^{q} t_i x^i, x_\ell \right)$
$(\ell = 1, 2, \cdots, N)$,Among them,

$$\sum_{i=1}^{q} t_i \left(x^r\right) x^i = \frac{\sum_{\ell=1}^{N} \beta_\ell \left(x^r\right)' x_\ell}{\sum_{\ell=1}^{N} \beta_\ell}$$
$$r = 1, 2, \cdots, k$$

(15)

From the above formula, we can know that the iteration formula is:

$$\begin{bmatrix} t_1 \\ t_2 \\ \vdots \\ t_q \end{bmatrix} = \begin{bmatrix} (x^1)'x^1 & (x^1)'x^2 & \cdots & (x^1)'x^q \\ (x^2)'x^1 & (x^2)'x^2 & \cdots & (x^2)'x^q \\ \vdots & \vdots & \cdots & \vdots \\ (x^q)'x^1 & (x^q)'x^2 & \cdots & (x^q)'x^q \end{bmatrix}$$

$$\begin{bmatrix} (x^1)'x_1 & (x^1)'x_2 & \cdots & (x^1)'x_N \\ (x^2)'x_1 & (x^2)'x_2 & \cdots & (x^2)'x_N \\ \vdots & \vdots & \vdots & \vdots \\ (x^q)'x_1 & (x^q)'x_2 & \cdots & (x^q)'x_N \end{bmatrix} \begin{bmatrix} \beta_1 \Big/ \sum_{\ell=1}^{N} \beta_\ell \\ \beta_2 \Big/ \sum_{\ell=1}^{N} \beta_\ell \\ \vdots \\ \beta_N \Big/ \sum_{\ell=1}^{N} \beta_\ell \end{bmatrix} \tag{16}$$

$$\beta_\ell = w_\ell k \left(\sum_{i=1}^{q} t_i x^i, x_\ell \right)$$
$$(\ell = 1, 2, \cdots, N) \tag{17}$$

$$w_\ell = \sum_{j=1}^{d} \sum_{i=1}^{N} \alpha_i^j k(x_i, x) \alpha_\ell^j \tag{18}$$

The initial value of the iteration takes:

$$\begin{bmatrix} t_1(0), t_2(0), \cdots, t_q(0) \end{bmatrix}$$
$$= [1/q, 1/q, \cdots, 1/q]' \tag{19}$$

As shown in Figure 1, the image restoration algorithm based on local linear properties is summarized, which mainly includes the following three steps:

- The algorithm calculates the coordinate ϑ of the test sample x in the feature space.

- The algorithm obtains the q nearest neighbors $x^1, x^2, \cdots, x^q$ of the test sample x by calculating the q nearest neighbors $\vartheta^1, \vartheta^2, \cdots, \vartheta^q$ in the feature space.

- The algorithm obtains the original image x^* of the test sample x through calculation.

The algorithm relies on two important input parameters: bandwidth σ and the number of nearest neighbors q. The selection of parameter σ can be determined by the subsequent numerical stability analysis. he selection of parameter q needs to follow two rules. First, the number of nearest neighbors q cannot be too large, because the algorithm has an assumption that it is locally linear.

Second, if $q \geq n$ (n is the dimension of the sample), the matrix $(X^q)'X^q$ is irreversible.

Local convergence theorem: the iteration format is:

$$x^{(i+1)} = Bx^{(i)} + f \tag{20}$$

The necessary and sufficient conditions for convergence are:

$$\rho(B) < 1 \tag{21}$$

(a) Sample reconstruction   (b) Dimensionality reduction processing
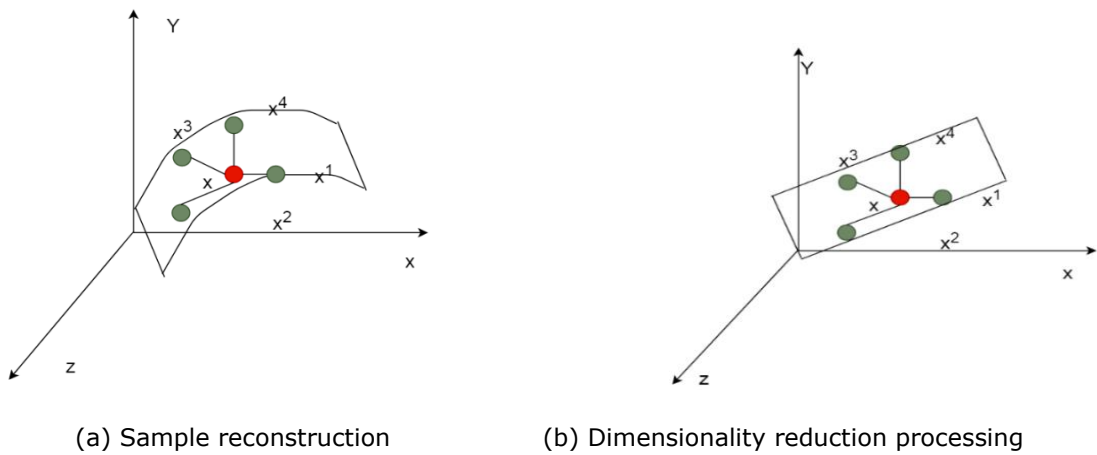
Figure 1: Schematic diagram of KPCA's image restoration based on local linear properties.

Among them, $\rho(B)$ represents the spectral radius of matrix B. For the convenience of calculation, construct the following matrix vector form:

$$T = \left(\left(X^q\right)'X^q\right)^{-1} \cdot \left(\left(X^q\right)'X^q\right) \cdot B \qquad (22)$$

Among them, the vector $B = \left[\beta_1 \middle/ \sum_{\ell=1}^{N} \beta_\ell , \beta_2 \middle/ \sum_{\ell=1}^{N} \beta_\ell , \cdots , \beta_N \middle/ \sum_{\ell=1}^{N} \beta_\ell \right]'$.

The Jacobi matrix corresponding to the nonlinear iterative format is:

$$J_T = \left(\left(X^q\right)'X^q\right)^{-1} \cdot \left(X^q\right)'X$$

$$\cdot \begin{bmatrix} \dfrac{1}{\sigma^2 \sum_{\ell=1}^{N} \beta_\ell} \Lambda \left(X - X^q te\right)'X^q - \\ \dfrac{1}{\sigma^2 \left(\sum_{\ell=1}^{N} \beta_\ell\right)^2} \Lambda \left(\left(X - X^q t\right)\beta e\right)'X^q \end{bmatrix} \qquad (23)$$

Among them, $e = [1,1,\cdots,1]$ represents the row vector of $1 \times N$, and $\beta = [\beta_1,\beta_2,\cdots,\beta_N]'$, $t = [t_1,t_2,\cdots,t_q]'$, and

$$\Lambda = \begin{bmatrix} \beta_1 & 0 & \cdots & 0 \\ 0 & \beta_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \beta_N \end{bmatrix} \qquad (24)$$

According to the local convergence theorem, if the spectral radius $\rho(J_T)$ of the Jacobi matrix J_T is less than 1, then the nonlinear iterative algorithm is locally convergent. We can make $\rho(J_T) < 1$ by choosing a sufficiently large bandwidth σ.

Figure 2 shows an example of the result of dimensionality reduction of image data through the above algorithm.
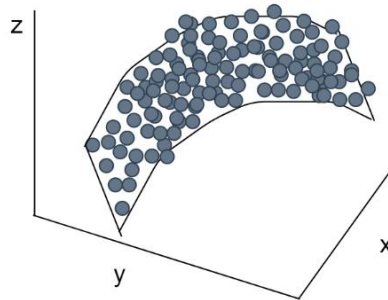

Figure 2: The result of dimensionality reduction of data.

4   SYSTEM CONSTRUCTION

The system middleware plays a decisive role in the response to large-scale concurrent processing, the transparent support for the interconnection of heterogeneous systems, the ability to ensure transaction integrity, and the security protection of application data. The system module diagram is shown in Figure 3.
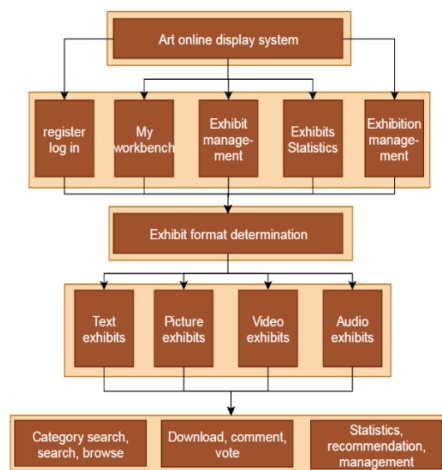

Figure 3: System module diagram.

The diversification of art design works, the diversification of formats, and the integration of functions are the characteristics of this system. Therefore, the good design of art design work management plays a vital role in the effective management of art design works. In the process of informatization management of art design works, as the management design of art design works, its firmness, safety, timeliness, economy and other quality standards are relatively intuitive and have detailed data to test. However, the design of art design works as art, its standards are not so simple. The individuality of the artistic image, the subjectivity of the aesthetic feeling, and the originality of the art often have their own characteristics and strengths. Therefore, we should unify the standards in

the interface style and design of the management of art design works, and not only pay attention to and show the personality of the art design works, but also unify the art of the entire system to better improve user experience recognition.

First of all, the management of art design works should proceed from the perspective of information security and strictly control key functional links such as downloading, uploading, reviewing, deleting, and backing up the information of art design works. At the same time, we need to control the user role empowerment function, review the legality, authenticity, originality, and expandability of the content of uploaded art design works, and perform regular incremental dumps of system art design works to maintain system security and stability. In addition, it is necessary to conduct business training for system administrators to enhance their security awareness, standardize business operations, and improve business capabilities. Moreover, it is necessary to make the art work online display system into a real-time, practical, and reliable information management system, so as to provide a good platform for appreciation, learning and communication for the teachers and students of the whole college and social art lovers. Secondly, it is necessary to strictly control the authenticity of art design works. In order to attract the support of system users to the greatest extent, the design of art design works must give full play to the designer's creative ability and rich imagination to create unconventional aesthetic images and works. At the same time, the design of art design works must pay attention to the authenticity of aesthetic creation, that is, the information conveyed must be accurate, and cannot be exaggerated or bluffing. This is also a key issue for the exhibition of art design works in this system. Otherwise, it will not only lose credibility and violate professional ethics, but also cause psychological aversion to users and viewers, and endanger the survival of the system. In addition, on the premise of ensuring the authenticity of the art design work, it is necessary to control the legality of the art design work, and determine whether it is a prohibited text, picture, video, or audio file on the Internet. Thirdly, this system, as an effective image dissemination platform for the works of teachers and students of the college, must pay attention to the originality and innovation of art design works. This kind of creation involves the imagination of the positioning space of the form, the choice of materials, the peculiarity of the structure, the treatment of colors, and the conceptual standards of the way. Moreover, innovation should be combined with the aesthetic needs of users to meet users' interests and orientation in a targeted manner, pursue the novelty of artistic design works, and use appropriate communication and display methods (text, pictures, audio, audio) to create a changeable visual communication effect, so that system users can feel free, cordial and sensible, and better serve the society. Finally, in the same thematic exhibition, or the same type of art design works, it is necessary to follow the neat and unified standards of the art design works, including the unified form, the unified color, the unified technical standard, the unified craft, and the unified style. In short, good art design works are very clear in terms of the order of art forms.

For specific users and their functional operations, it can be seen that the flow chart of of management of art design works is shown in Figure 4, and the functional structure diagram of management of art design works is shown in Figure 5.

The structure diagram of the server of the application database is shown in Figure 6. Then, we use the algorithm proposed in this paper for learning. The results show that the algorithm in this paper can indeed reflect the degree of similarity between classes, as shown in Figure 7. It can be seen from Figure 8 that the algorithm proposed in this paper can also solve the problem of low-dimensional unsupervised learning.
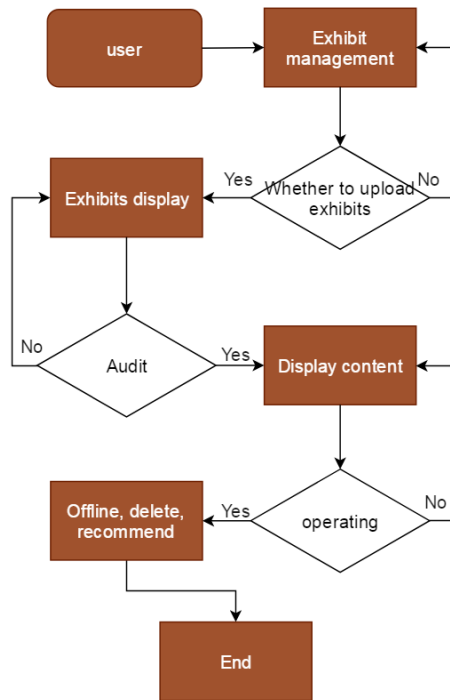
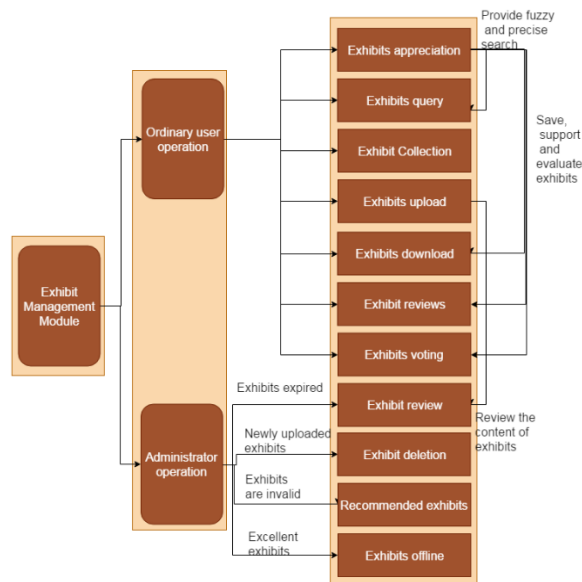**Figure 4:** Flow chart of management of art design works.

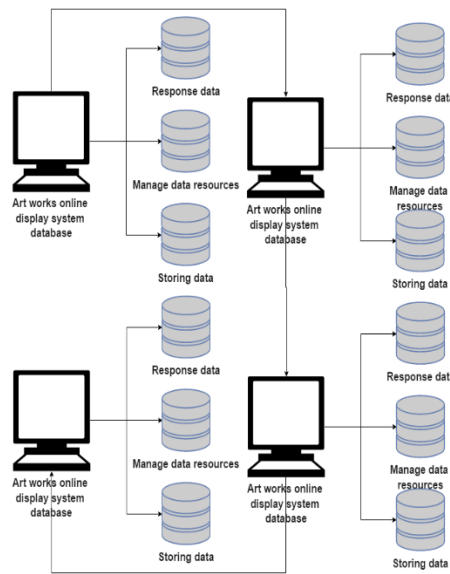**Figure 5:** Functional structure diagram of management of art design works.

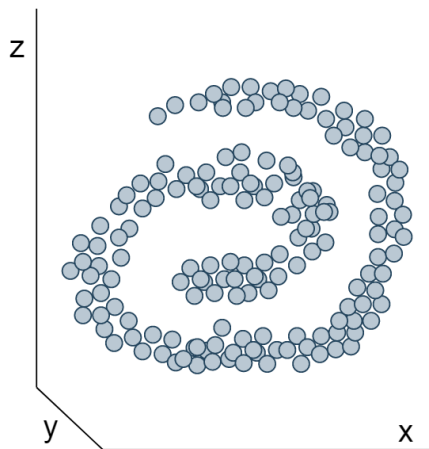**Figure 6:** The structure diagram of the database.

Figure 7 Fitting results of 200 samples on 3D Swiss roll.

5   MODEL VALIDATION

After constructing the above model, the performance of the online art design exhibition system based on VR technology and machine vision constructed in this paper is tested, and the performance of the system constructed in this paper is verified. The system constructed in this paper can apply 3D virtual reality technology and machine vision technology to the system. First of all, this paper conducts a research on the effect of artistic design, and conducts a quantitative analysis of the effect of systematic artistic design through the scores of multiple sets of artistic design products. The results are shown in Table 1 and Figure 9.
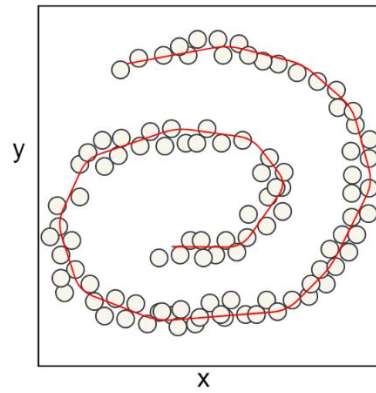
Figure 8: Denoising results using 200 sample points on a 2D Swiss roll with noise.

Number	Scores	Number	Scores	Number	Scores
1	92.0	35	92.1	69	85.5
2	84.8	36	95.5	70	87.2
3	89.2	37	88.8	71	94.3
4	93.8	38	88.7	72	86.7
5	86.0	39	89.4	73	92.5
6	94.0	40	85.5	74	92.0
7	87.3	41	90.1	75	92.0
8	87.5	42	85.9	76	93.6
9	94.4	43	88.2	77	93.8
10	91.3	44	87.9	78	94.5
11	90.8	45	94.2	79	94.3
12	91.4	46	92.1	80	92.8
13	95.7	47	89.5	81	84.4
14	94.4	48	92.6	82	85.1
15	95.4	49	94.9	83	92.1

16	94.7	50	89.5	84	90.1
17	88.0	51	87.8	85	92.8
18	84.4	52	88.7	86	88.1
19	85.0	53	86.1	87	94.0
20	89.5	54	94.6	88	86.8
21	84.4	55	89.0	89	88.4
22	86.2	56	86.5	90	92.2
23	90.3	57	84.6	91	96.0
24	89.7	58	88.6	92	90.3
25	90.8	59	89.4	93	94.0
26	85.6	60	89.7	94	89.9
27	93.6	61	85.8	95	90.3
28	92.4	62	89.8	96	84.7
29	91.8	63	90.7	97	93.5
30	86.2	64	92.7	98	87.8
31	87.7	65	84.1	99	93.9
32	84.5	66	94.3	100	87.8
33	89.8	67	92.1	101	87.2
34	90.0	68	94.1		

Table 1: Statistical table of the scores of online design effects of art works.

As shown in Table 1 and Figure 9, the model constructed in this paper is highly evaluated in terms of artistic design effects. Next, this paper studies the work display effect of the online works display system of art design based on VR technology and machine vision. The results are shown in Table 2 and Figure 10.
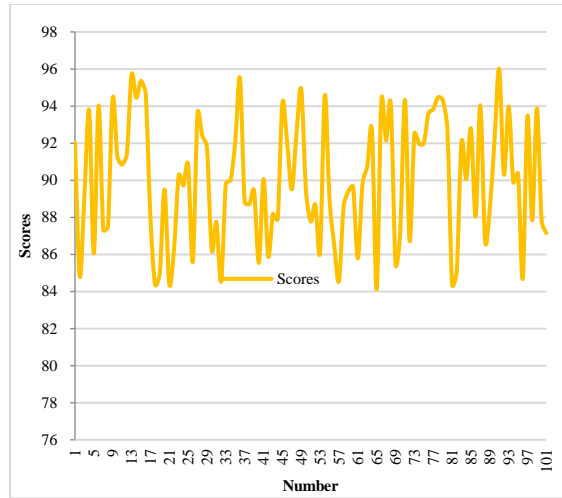
Figure 9: Statistical diagram of the scores of online design effects of art works.

Number	Scores	Number	Scores	Number	Scores
1	86.8	35	78.5	69	87.5
2	85.5	36	79.3	70	84.0
3	89.7	37	78.2	71	78.9
4	85.2	38	79.2	72	90.0
5	83.4	39	83.6	73	80.0
6	90.3	40	88.1	74	87.5
7	88.2	41	83.0	75	89.1
8	90.0	42	82.0	76	86.8
9	79.1	43	83.8	77	82.9
10	87.8	44	88.0	78	83.4
11	79.5	45	87.2	79	83.8
12	78.8	46	81.3	80	88.1
13	86.5	47	80.9	81	82.1

14	*90.4*	*48*	*90.5*	*82*	*86.8*
15	*79.4*	*49*	*81.9*	*83*	*85.9*
16	*83.5*	*50*	*78.2*	*84*	*79.8*
17	*83.9*	*51*	*79.5*	*85*	*79.1*
18	*80.8*	*52*	*85.4*	*86*	*89.3*
19	*80.4*	*53*	*90.9*	*87*	*90.9*
20	*83.4*	*54*	*88.1*	*88*	*87.6*
21	*88.8*	*55*	*80.0*	*89*	*85.8*
22	*86.1*	*56*	*79.4*	*90*	*78.3*
23	*88.9*	*57*	*88.7*	*91*	*79.9*
24	*87.0*	*58*	*87.7*	*92*	*78.7*
25	*86.2*	*59*	*83.4*	*93*	*87.2*
26	*80.6*	*60*	*81.8*	*94*	*89.9*
27	*82.0*	*61*	*86.9*	*95*	*82.9*
28	*82.9*	*62*	*80.6*	*96*	*88.6*
29	*89.6*	*63*	*84.4*	*97*	*86.4*
30	*88.2*	*64*	*78.5*	*98*	*88.2*
31	*81.8*	*65*	*89.8*	*99*	*89.3*
32	*84.8*	*66*	*83.3*	*100*	*83.7*
33	*90.1*	*67*	*78.6*	*101*	*86.1*
34	*89.4*	*68*	*83.7*		

Table 2: Statistical table of the scores of the work display effect of the online works display system of art design based on VR technology and machine.
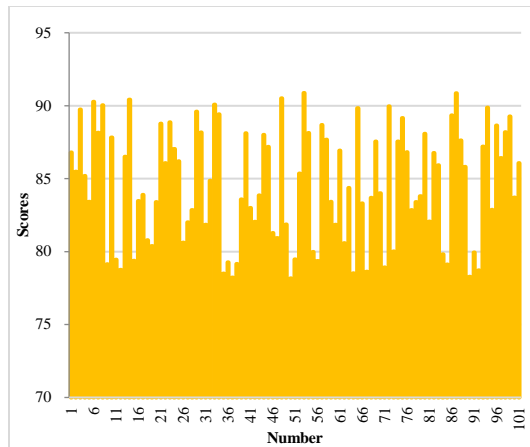
Figure 10: Statistical diagram of the scores of the work display effect of the online works display system of art design based on VR technology and machine vision.

6   CONCLUSION

In view of the management and standard problems in the exhibition of art works, this paper analyzes the current art design online works display problems, researches and analyzes the system requirements and related technologies of the art works online display system, and gives some corresponding solutions. The main work of this paper is to build an online display system of art works based on VR technology and machine vision, and briefly introduce the system functions, realize the detailed design of the system, and propose a sampling algorithm based on nuclear alignment. The algorithm uses kernel alignment to measure whether the sample is significant relative to the training set, and continues to add representative samples to the training set until the selected training set can represent the overall characteristics. The experimental results show that when the training set selected based on kernel alignment and the randomly selected training set are used in the image processing system, the calculation accuracy is increased by an amount. At the same time, experimental research has also verified that the system constructed in this paper is effective.

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