Research Article

Application of SVM-KNN Network Detection and Virtual Reality in the Visual Design of Artistic Images

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The birth of computers has brought us unexpected progress and development in many ways. In this very real world of our human existence, the beginning of human perception of the world. It is a sensory organ that collects sensory information, and the same goes for people's artistic creation and design. This paper discusses the classification effect of the combined model of support vector machine and SVM-KNN on the problem of virtual reality art images, analyzes the parameters of the optimized combined model, and then conducts a series of simulation analyses on the optimized model. So using this method can make the collected data more real and reliable, and it will be very convenient for us to process. Use the SVM algorithm to train the classifier when performing data classification and compare different training sample sizes and different kernel functions for empirical analysis and in-depth analysis of the accuracy of the two and the impact of the model. Through the data comparative analysis of SVM-KNN, the obtained results are more real and effective.

1. Introduction

In this very real world in which we humans exist, the beginning of human perception of the world is the collection of sensory information by sensory organs, and the same goes for people's artistic creation and design [1]. The multidimensional information obtained from various sensory organs is vivid and specific, which is conducive to people's understanding and acceptance, is more in line with people's living habits, and stimulates people's creative thinking. Therefore, for thousands of years, human beings have made great efforts and spent a lot of effort to produce a multidimensional environment simulation that fits their own feelings. People have also made progress during this arduous exploration [2]. From ancient times to the present, in human art. In the history of development, while creating art, he has been using and exploring various senses, creating and receiving multidimensional information. However, restricted by technological factors, the underdevelopment of technology makes this goal never come true [3, 4]. Virtual reality art design opens up new methods for achieving goals. By using this technology, designers can truly experience human emotions through various physiological activities such as vision, smell, and touch and this give designers richer inspiration and imagination to immerse themselves or It is empathy, which combines the thoughts in the human brain with environmental factors and transforms the thoughts in the mind into things that are visible to the naked eye [5]. We use SVM-KNN classification to investigate and use real and reliable data based on actual conditions, and use what we have learned plus our innovation to propose more optimized calculation and verification methods. It will not only make the results more accurate but also make it more convenient and faster for us to collect data and provide good technical support for the visual design of information art technology.

2. Related Work

Some research describes the meaning and purpose of virtual reality when conducting art design research. "Virtual reality

art design" is a cutting-edge topic in modern art design [6]. It has found a new point of convergence between art and science and, at the same time, straddles art and science. Some research clarifies the basic content of virtual reality, immersiveness, and the unity of nature and man, expounds and explains the origin and history of design art. While discussing the art of design which is very virtual but realistic, it also explains the research object, research purpose, research method, and research reason of this article. Some research mainly explained the visual effects and research methods that are usually applied in virtual reality art design from three aspects [7]. Some research discusses that in virtual reality art design, we can give new characteristics to the produced works through this technology, give people a bright feeling, let people feel unheard of things, and even travel through time and space situation [8]. Some research discusses that after the use of virtual reality art design, people's lives have undergone a series of earth-shaking changes, which have had a huge impact on people's production and lives. Some research discusses that after the emergence and development of virtual reality art design, contemporary art has made an obvious development. It can be seen that virtual reality art has a far-reaching influence and helps in the prospect of modern art water design. Some research mainly reveals the unique and innovative aspects of virtual reality art design in life production, scientific development, entertainment, environmental protection, technical research, etc. Compared with the previous art design, this technology is now more complete, It is in a separate line and has higher compatibility [9, 10]. Some research uses examples to illustrate that from the birth of modern design to today, in the process of its development and growth, the chemical reaction of art and technology has occurred all the time, and the two have been combined with each other to develop until now, the two interlaced each other to appear as virtual reality art. Some research uses data as a direct entry point for comparative analysis and gives detailed introductions one by one of the types, characteristics, attributes, and sources of the data, which provides great convenience for later data processing and application [11] and saving processing time and processing costs. Some research uses the SVM model to train a SVM classifier in terms of the accuracy of data processing and then adds preprocessing and classification and grouping steps on this basis to make the data obtained by the calculation more accurate. Some research introduces the nearest proximity method and proposes the advantages of this method, and then improves the SVM model on this basis, and at the same time applies the SVM-KNN method to combine and compare artistic design with reality empirical analysis [12].

3. The Theoretical Basis of SVM-KNN Network Detection and Virtual Reality Technology

3.1. Principle of Linearly Separable SVM. It has been nearly a century since the birth of support vector machines. In these years, the technology of support vector machines has also been developed rapidly. In order to make this technology easier to learn and to be widely promoted, scientists have

found several excellent methods. In SVM research, the most basic and most important problem is the problem of two classifications. We assume that the training sample is (x_i, y_i), where $i = 1, 2, \ldots, n$, category C_1, the category C_2 is originally on both sides of the constructed classification function. From the above figure, as long as a straight line that satisfies the linear division of the sample on both sides of the plane is obtained, no matter how many there are, it is the optimal classification hyperplane.

Assumption function: $g(x) = wx + b$, where w is the normal vector of the hyperplane, which determines its vector direction, b is the displacement vector, which determines the distance from the origin, and x is the observed value vector of the sample. At this time, the sample x_k to be classified needs to be judged which category it belongs to, only the value of $g(x_k)$ needs to be looked at. If $g(x_k) > 0$, it is judged that the sample x_k belongs to the category C_1: on the contrary, it is judged that the sample x_k belongs to the category C_2.

Then we get the following equation:

$$f(x) = \text{sgn}[g(x)]. \tag{1}$$

In the second classification, the classification is marked with "+1" and "−1," which respectively indicate the two classification categories of the sample and define the interval from the sample point x_i to the hyperplane:

$$\delta_\iota = y_i(wx_i + b). \tag{2}$$

If the sample x_i belongs to the category as follows:

$$|g(x_i)| = |wx_i + b|, \tag{3}$$

normalizing w and b, we get the following equation:

$$\delta_i^* = \frac{1}{\|w\|}|g(x_i)|. \tag{4}$$

Obtain a hyperplane, so that the original sample points reach the farthest position from the classification hyperplane to obtain the following objective function at this time:

$$\text{Max}\frac{1}{\|w\|}|g(x_i)|. \tag{5}$$

The distance between H_1 and H_2 can be expressed as:

$$\delta = \frac{1}{\|w\|}. \tag{6}$$

At this time H_1 is as follows :

$$wx_i + b = -1. \tag{7}$$

H_2 is as follows:

$$wx_i + b = +1. \tag{8}$$

H_3 is as follows:

$$wx_i + b = 0. \tag{9}$$

When $|g(x_i)| = 1$, the distances from other sample points to the classification hyperplane are not less than 1, then we get the following equation:

$$y_i(wx_i + b) \geq 1, \quad i = 1, 2, \ldots, n. \tag{10}$$

Use linear programming to find the hyperplane at this time as follows:

$$\min \frac{1}{2}\|w\|^2$$
$$\text{s.t.} \quad y_i(wx_i + b) \geq 1 \tag{11}$$
$$i = 1, 2, \ldots, n.$$

Construct the Lagrange function as following:

$$L(w, b, \alpha) = \frac{1}{2}\|w\|^2 - \sum_{i=1}^{n} \alpha_i[y_i(wx_i + b) - 1]. \tag{12}$$

Among them, α_i is the constrained Lagrange multiplier. Since it is an inequality constraint condition, $\alpha_i \geq 0$. The optimization objective function is transformed as follows:

$$\min_{w,b}\max_{\alpha_i \geq 0} L(w, b, \alpha). \tag{13}$$

The objective function satisfies the KKT condition. According to the Lagrange duality, the optimization problem is transformed into an equivalent dual problem for the following solution:

$$\max_{\alpha_i \geq 0}\min_{w,b} L(w, b, \alpha). \tag{14}$$

First find the minimum value of $L(w, b, \alpha)$ under w and b, and then find the partial derivatives of w and b, respectively, as follows:

$$\frac{\partial}{\partial w} L(w, b, \alpha) = w - \sum_{i=1}^{n} \alpha_i y_i x_i = 0,$$
$$\frac{\partial}{\partial b} L(w, b, \alpha) = \sum_{i=1}^{n} \alpha_i y_i = 0. \tag{15}$$

The normal vector corresponding to the optimal hyperplane can be obtained as follows:

$$w = \sum_{i=1}^{n} \alpha_i y_i x_i. \tag{16}$$

And the Lagrange multiplier corresponding to the most hyperplane satisfies the following condition:

$$\sum_{i=1}^{n} \alpha_i y_i = 0. \tag{17}$$

Eliminating w from the above formula gives the following equation:

$$\varphi(\alpha) = \frac{1}{2}\|w\|^2 - \sum_{i=1}^{n} \alpha_i[y_i(wx_i + b) - 1]$$
$$= \sum_{i=1}^{n} \alpha_i - \frac{1}{2}\sum_{i=1,j=1}^{n} \alpha_i \alpha_j y_i y_j x_i^T x_j. \tag{18}$$

Maximize the above formula as follows:

$$\max_{\alpha} \sum_{i=1}^{n} \alpha_i - \frac{1}{2}\sum_{i=1,j=1}^{n} \alpha_i \alpha_j y_i y_j x_i^T x_j$$
$$\text{s.t.} \sum_{i=1}^{n} \alpha_i y_i = 0 \tag{19}$$
$$\alpha_i \geq 0$$
$$i = 1, 2, \ldots, n.$$

The above formula is equivalently exchanged as follows:

$$\min_{\alpha} \sum_{i=1}^{n} \alpha_i - \frac{1}{2}\sum_{i=1,j=1}^{n} \alpha_i \alpha_j y_i y_j x_i^T x_j$$
$$\text{s.t.} \sum_{i=1}^{n} \alpha_i y_i = 0 \tag{20}$$
$$\alpha_i \geq 0$$
$$i = 1, 2, \ldots, n.$$

Find the corresponding value of w as follows:

$$w^* = \sum_{i=1}^{n} \alpha_i^* y_i x_i. \tag{21}$$

After calculating w^*, the value of b is solved, then for any support vector we get the following equation The following inference can be drawn:

$$y_s(wx_s + b) = y_s\left(\sum_{i=1,j=1}^{n} \alpha_i y_i x_i^T x_j + b\right) = 1. \tag{22}$$

$$b_s^* = y_s - \sum_{i=1,j=1}^{n} \alpha_i y_i x_i x_s. \tag{23}$$

Finally we get the classification function:

$$f(x) = \text{sign}(w^* x + b^*) = \text{sign}\left(\sum_{i=1,j=1}^{n} \alpha^* y_i x_i x + b^*\right). \tag{24}$$

3.2. Improved SVM-KNN Method.

In this paper, based on the literature research, we innovate and upgrade the calculation formula, adding the calculation of feature weights to better improve SVM-KNN. Using this method in the face of the general SVM-KNN algorithm, it can be used in the case of parameters. Next, find the optimal solution to the problem in time to improve the efficiency and accuracy of classification and detection.

TABLE 1: Table of common dangerous permission characteristics in Android.

Authority group name	Authority name	Permission description	Permission type
INTERNET	INTERNET	Access network	System authority
	CHANGE_NETWORK_STATE	Change network status	Paid
SMS	SEND_SMS	Send messages	Paid
	RECEIVE_SMS	Receive SMS	Privacy authority
	WRITE_SMS	Read SMS	Privacy authority
	READ_SMS	Edit SMS or MMS	Privacy authority
CONTACTS	READ_CONTACTS	Access contact information	Privacy authority
	WRITE_SMS	Write contact information	Privacy authority
PHONE	CALL_PHONE	Dial number	Paid
	READ_PHONE_STATE	Access phone status	Privacy authority
	READ_CALL_LOG	Read call log	Privacy authority
	PROCESS_OUTGOING_CALLS	Monitor and modify broadcast calls	Privacy authority

TABLE 2: Table of characteristics of common risk mechanisms in Android.

Risk mechanism characteristics	Confusion mechanism class	CRYPTO, ASCII OBFUSCATION
	Program mechanism class	NATIVE, DYNAMIC, PEFLECTION

TABLE 3: Common sensitive call API feature table A in Android.

Sensitive call API characteristics	Network class	GetNetworkInfo, getActiveNetworkInfo, openConnection, connect, GetInputStream, getOutputStream, openStream, isWifiEnabled, getScanResults, getConnectionInfo
	Privacy	getSubscriberId, getDeviceId,getSimSerialNumber, getLine1Number, invalidateAuthToken, openInputStream, getDefault, getAccounts, getlastKnownLocation, requestLocationUpdates, isProviderEnabled, sendData, setAudioSource, getPhoneContacts, getCellLocation
	Paid	sendMultipartTextMessage, sendTextMessage
	System class	setComponentEnabledSetting, new Wakelock, notify, addNotificaction, setAudioSource, setDefaults, execute, setAudioSource, getRingerMode, vibrate, reboot

We first need to process the vector of the data, using the support vector machine-based under-sampling balanced training set method to find a set of support vectors from the type of set with more original training sets and then extract them to form the balanced set [13]. In actual operation, if the differences between samples are directly ignored in the calculation, the evaluation results will be unstable and the classification accuracy will also be inaccurate. Therefore, we consider the use of an analytic hierarchy process to calculate the influence proportion of feature indicators, and then calculate the weight of different features. The classification accuracy rate is greatly improved.

3.3. Experimental Simulation Analysis of SVM-KNN Network Detection. In the experiment, a total of 200 training software samples were used. Among them, there were 100 normal software and 100 malicious software. The category labels were 1 (positive class) and −1 (negative class).

This article combines fine-grained permission declaration and risk mechanism, intent priority, sensitive API and other grammatical features, extracts the flowDroid-based privacy data taint propagation path set as semantic features, and uses a variety of effectively mixed static features to improve detection coverage and accuracy, etc. Among them, the common dangerous permissions in Android are shown in Table 1:

Some common risk mechanisms and sensitive API calls with threats are shown in Tables 2 and 3:

In addition, we also consider that a series of security risks may arise during the experiment or hackers may deliberately do it, so we have stepped up prevention to monitor the network input and output numbers from time to time. In addition, considering the difference between explicit and invisible hidden dangers, the general network request is rejected. Intent in Android usually refers to the transmission of information. Confidentiality is very important [14]. A little carelessness will bring huge losses. This will not only consume huge resources and money for maintenance but also cause some confidentiality violations. If it is not kept properly, there will be endless troubles. The protection technology can be used as an important feature to distinguish normal software from malicious software in the implementation process. This article proposes to use dynamic analysis technology and tools to monitor and extract the following features of Android applications, as shown in Table 4.

If only one method is used to judge whether the software is running normally, this judgment standard is not enough, because many software seem to be running normally but have lost their basic data processing and comprehensive analysis capabilities, and some software is even judged as Malware, but it works well in the process of running. So we should also collect a series of data for analysis based on the effect of the software at runtime and construct a suitable space vector model and function model to vectorize and store it [15]. If the feature does not appear in the Android application, it is recorded as 0, otherwise the frequency or

TABLE 4: Collect a list of behavior characteristics.

Category	Feature name
The Internet	TxBytes, RxBytes, TPacket, RxPacket
SMS	Send verification/delete SMS
Cell phone	Dial number
Address book	Send/delete address book
Media	Open the camera and record in the background
Position	Obtain precise positioning information
File	Open/read/copy/rename/delete files
CPU	CPU usage (including load distribution and usage rate.)
Process	Process ID, process name, running process
Battery	Temperature, cleaning consumption, level
RAM	Internal vss remaining memory, shared memory, virtual consumption
APP	Close the application in the background, check the information of the sen application

number of times it appears in the specified time is counted as 1 or n ($n > 1$). For example, if a software goes online or sends a message privately without receiving instructions, it is recorded as 1. If it appears multiple times, it is recorded as n, otherwise it is 0. Finally, the recorded values are counted to construct a function model, and then the multiple recorded data is used as the sample set of the improved SVM-KNN algorithm, as a method of this combination, to provide a line of defense for software security detection. This leads to the third "fuse" besides static and dynamic, as shown in Table 5.

3.4. Features of Virtual Reality Art Design.

Virtual reality art has many characteristics, the most important of which can be summarized in the word "real." Let users really be able to achieve immersive goals with the help of this technology. Using virtual reality art, we can apply it to many aspects of life. For example, the special effects of movies and TV series that we are familiar with are simulated using this technology, and when actors perform some illusory scenes, they are usually given to actors. The feel of it facilitates its performance. Not only in these, but also in terms of network art, this technology is also very useful. Compared with traditional technology, this technology has great innovations and has caused rapid changes in many fields.

Immersiveness: immersive means that you are not in that environment but that you feel as if you are in that environment. Whether it is from sight, smell, or hearing, the requirements for being on the spot are very high. However, traditional art forms and artistic effects generally cannot meet this need. The traditional art forms we face are generally books. For example, through the description of the author and the reader's personal imagination, we can achieve a kind of empathy effect. However, with virtual reality technology, you can directly and accurately receive a series of information that the operator wants to convey without your own creation and imagination.

Interactivity: interactivity is whether people feel smooth and natural when they feel and receive information through virtual reality art. At the same time, it is also whether the creator of the work feels handy, easy to produce and express, rather than unable to convey the

TABLE 5: Table of classifier accuracy when taking different values of u and K.

K	u			
	0.1 (%)	0.2 (%)	0.3 (%)	0.4 (%)
1	75.000	85.000	86.667	85.000
3	78.333	88.333	93.333	91.667
5	83.333	91.667	88.333	81.667
7	81.667	90.000	80.000	76.667

desire to express. If the person who conveys the information feels comfortable using this technology and the person who receives the information also feels connected, then it is highly manipulable and interactive.

Intuition: the so-called intuitiveness is whether the designer can intuitively see the problems in the design through the simulated scenes, and then quickly correct them. At present, this feature of this technology has also been widely used. Most of the construction of squares and platforms uses this technology, thinking that once the construction of these projects is started, most of them are irreversible, so the preliminary work must be done well In place.

Virtual reality: virtual reality has also been widely used at present. This technology mainly uses virtual reality technology to portray existing things with more realistic images or images, so that some blurred and unclear objects are clear and intuitive. Show in front of people. After repairing some very precious ancient paintings and ancient books, designers often use this technique to repair them. In addition to repairing some precious murals and restoring the colors of the murals, this technique is also used. The Dunhuang Mogao Grottoes as we know them are realized by using the virtual reality of VR art design.

Collaboration: collaboration mainly emphasizes that virtual reality art design can be transmitted and shared through the network, just like a document or a form, which is very convenient to transmit. As the name suggests, this convenience can allow more designers to participate into the design of the same work. Even if they are far away, as long as there is a network, they can
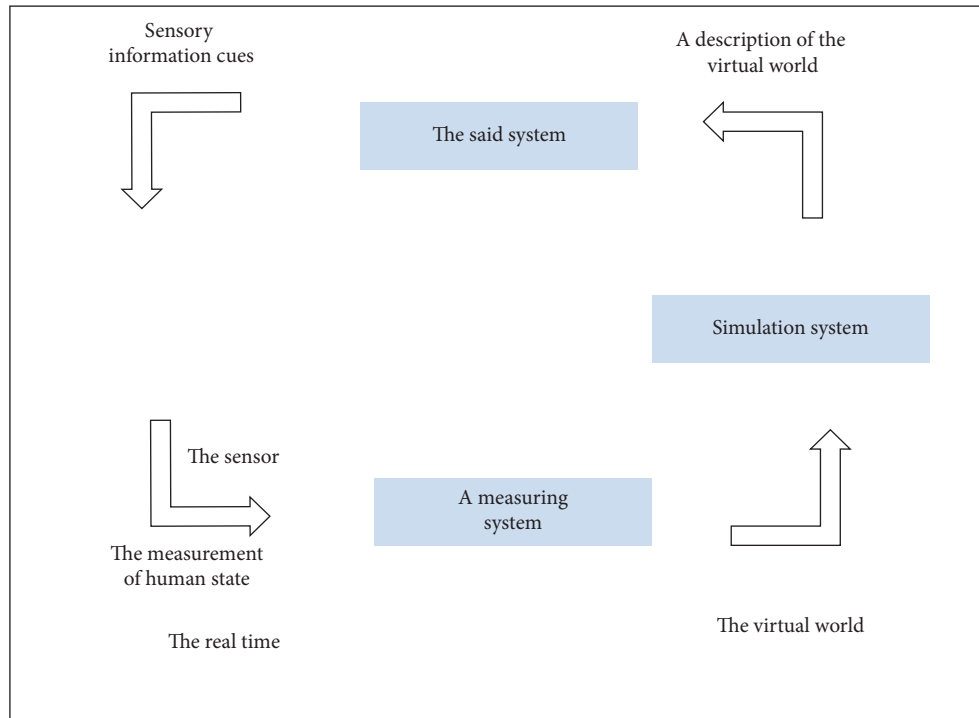
FIGURE 1: Realize the structure of virtual reality.

share and create in real time. Its collaboration is also an important feature that attracts resources.

First, a virtual object is simulated by the simulation system and also has other sensory characteristics, and then the record of this virtual world is transmitted to the presentation system. After the presentation system is processed, the sensory information prompts are transmitted from the sensor to the measurement system, and then feedback is given to the simulation system. This completes the process from the virtual world to the real world and then back to the virtual world. The structure of virtual reality is shown in Figure 1.

In virtual reality systems and their applications, technology has three outstanding characteristics: immersion, interaction, and imagination. Three characteristics of virtual reality are shown in Figure 2.

What are the modules of this system? I know that scholars from all over the world are arguing today, but the models proposed by each scholar are similar, so we believe that it is mainly composed of five parts. It is believed that this model will continue to improve and finally reach a consensus. Five typical components of the system are shown in Figure 3.

In fact, in addition to the conventional five typical components, scientists have also developed many new components because the sensor module is the core and the control module is also indispensable. The combination of these two modules is the most important part of this model. For the most part, the task is very heavy, so a detection module and a feedback module should be added to ensure smoother information transmission and higher accuracy. Composition of the VR system is shown in Figure 4.
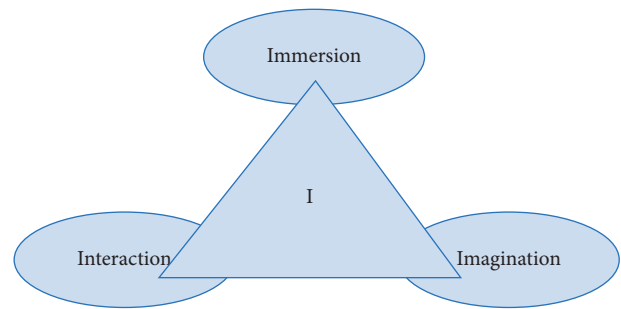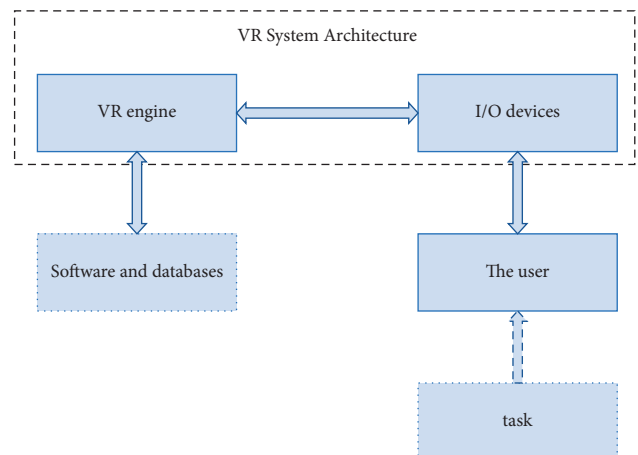

FIGURE 2: Three characteristics of virtual reality.

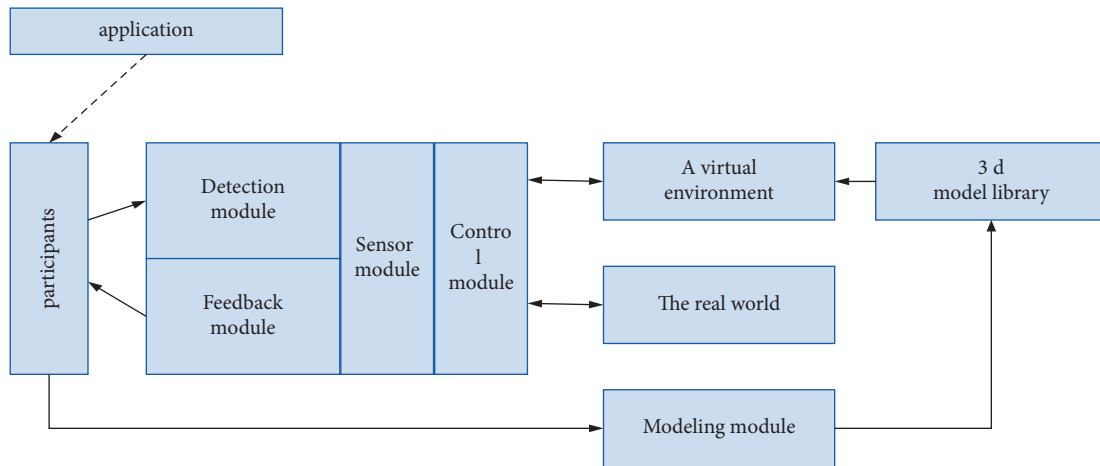FIGURE 3: Five typical components of the system.

FIGURE 4: Composition of the VR system.

As shown in the figure, the application gives participants a message, and then the participant controls the sensor module to communicate with the virtual environment through the detection module. The feedback module provides real-time feedback to the participant. On the one hand, the sensor module accepts the participant's instructions to act on the virtual environment. On the other hand, feedback the results of the operation to the participants.

4. Art Image Visualization Design Strategy and Result Analysis

4.1. Realization of the Visual Design of Virtual Reality Art Images. Desktop virtual reality art is mainly divided into two aspects: hardware and software. The hardware uses computers and other equipment to input and output the simulated images. In simple terms, it uses computer keyboards, mice, monitors, and other hardware devices to show the designed work and let the designer modify it intuitively. The software aspect uses some computer software and APP for independent modification and design, first classifying the designed works and then replan the design according to each part. At present, this technology has been applied to daily life, leisure, and entertainment.

The development of this technology also makes people want a more realistic experience. People are no longer just satisfied with being visually realistic, but more concerned with the realistic effects of smell, touch, taste, hearing, and so on. This technology is also different in terms of hardware and software. These two aspects have different focuses. Virtual reality technology distinguishes these two technologies through hardware and software. In terms of visual effects, hardware has more visual impact than software. And software is more innovative and complex in terms of simulation and beyond reality. For virtual reality art, innovation is often more important, so the development of software is also more important, especially for the new, simpler, and more effective software design that can further enhance the development space of Internet computers and virtual reality art.

4.2. Visual Effects of Visual Design of Virtual Reality Art Images. This technology is a simulation technology. It is based on the characteristics of actual things and uses appropriate materials to construct an identical thing that expands and shrinks in the same proportion. For example, if we want to visit many places of interest but are far away or unable to go for some other reason, we can use this technology to construct a model for visit. Owning many famous cars is a dream of many people, but not everyone can afford all the cars they like, so you can buy a simulation model of the car to satisfy your desire.

To achieve "likeness" is to visually resemble the objects we see every day, so that people will know that they are such objects at first impression after seeing them. Not only that but also in terms of hearing, touch, and sensation, and the ability to be imitated things are very similar, just like watching a 5D movie, making people feel like they are in it.

Transcendental virtualization mostly virtualizes the environment that humans cannot personally experience and see with their own eyes in daily life. For example, when launching artificial rockets, we cannot really observe people's orbital changes in space. However, we can use virtual reality art to make animations to simulate this process, or when man-made satellites reach the Moon and Mars for landing, some semivacuum environments can also be simulated, which brings a lot of convenience to designers, but also reduces the failure rate.

4.3. The Influence of Virtual Reality Art on Image Visualization Design. The impact of virtual reality art is very far-reaching. For example, in terms of production, it is necessary to use this kind of virtual reality art to produce some simulated machines. And this production process is to first use this technology to outline and describe the precise shape of the product you want to design on the computer and then use 3D printing and other technologies to copy and print the product shape described. Products manufactured by this method are often simpler and easier to operate than traditional methods. Using this technology, it is often possible to manufacture some very precious and difficult items,

because this technology can depict the required scene very realistically, which enables the manufacturer to repeatedly adjust during manufacturing. This process is completely mechanical and accuracy rate is also very high, making it not easy to make mistakes and errors.

In daily teaching, virtual reality art is also used everywhere. At the same time, this technology is often used when researching big power weapons, such as airplanes, aircraft carriers, and tanks, when designing. In many schools, teachers use this technology in PPT to demonstrate and simulate unheard or unimaginable things to students. In addition, when studying the atomic bomb and hydrogen bomb, some of the more harmful explosion tests could not be carried out in real tests. They all used virtual reality art design and simulated experiments to obtain valid data for research. It not only saves a lot of expenses and reduces the cost of testing, but also makes the process safer and easier in the aftermath.

5. Conclusion

In the past many years, many things were very close and inseparable. Among them, technology and design are typical examples. If the industrial revolution is the source of design, today's virtual reality art design will bring new vitality to art design. Many characteristics of virtual reality art have laid a solid foundation for it to become a popular "candidate" in many industries. For example, it has been widely used in real-life CS games because it allows people to be in a virtual environment. People indulge in it and cannot extricate themselves from the situation in the wilderness battle. Another example is its organic combination with computer technology and 3D printing technology, which also makes many impossible possible by making many tedious tasks simple and efficient. Therefore, it is only a very forward-looking and developmental project. At the same time, this technology needs to be better developed. There are still many gaps that give it a lot of room for development. If this technology is further developed in the near future, it will bring huge changes to people's production and lifestyles. Moreover, it is inseparable from various fields, and it is a highly intersecting discipline. Its development will also drive the development of various fields, and the economic impact will be countless.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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