Application and Development of VR Technology in Painting

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Abstract. Virtual reality (VR) technology makes it possible to interact directly with virtual space. Virtual reality enables everyone to draw three-dimensional graphics in this intuitive way. So we study VR virtual reality technology and painting. We use photo sprayer, a virtual painting tool, to create digital art in virtual reality (VR). Users can capture images of local landscapes, objects, faces or random details and convert them into colors and patterns of digital artworks on 2D surfaces and 3D objects. Previous studies have shown that both the rendering of 3D objects and the use of virtual reality can improve the skills of mental rotation and spatial visualization. Since virtual reality drawing is a combination of non memory activities, it seems to be a promising ability to study its influence on these spaces. This paper studies the educational application of virtual reality painting and its relationship with spatial ability.

Keywords: VR Virtual Reality Technology, Interactive Design, Painting, Art

1. Introduction
With the rapid development of science and technology, VR virtual reality technology has become indispensable in our life. With its strong immersion experience, VR has been used in many fields. VR itself is a new medium, and its immersive experience is applied to different groups of people, and its effect is not the same. In the process of analysis and research, this paper focuses on the combination of theory and practice, using examples to explain the theory, and strive to provide guidance for the creation of VR technology in film and television art from the perspective of technical beauty, which can provide reference for aesthetic analysis of VR technology in film and Television Art.

Due to the continuous improvement of computer technology, many experts have studied VR virtual reality technology. For example, some domestic teams have explored the application of VR technology in the product design method with color visual effect as the core, and discussed the advantages of VR technology in reducing the difficulty of operation and the application mode in the product design method. VR technology is used to express design ideas in space, and product appearance design practice is carried out. The research on color conception at the three-dimensional level greatly improves the efficiency and quality of color conception, which is convenient for design colleges and enterprise designers to refer to, so as to break through the fixed thinking of design and increase more added value and competitiveness for products [1]. Some other teams have studied VR technology and film and television technology. According to the aesthetic characteristics of technical beauty pointed out by a scholar, the author discusses the functional beauty of VR technology in film
and television art from three aspects: immersion and entry, interaction and shaping, imagination and spectacle. This paper summarizes and analyzes the aesthetic defects in the application of VR technology in film and television art, and puts forward the corresponding countermeasures based on people-oriented and humanistic [2]. Some experts have also studied VR and animation, compared VR animation with traditional animation experience, affirmed the advantages of VR animation in three aspects of time-space boundary, participation and interaction, and emotional feeling, and emphasized its immersion, interactivity, emotional needs and psychological mechanism different from traditional animation. It is concluded that virtual reality technology involved in animation creation can make animation obtain more abundant forms of expression and bring deeper artistic experience, provide a new creative path for the innovation and development of animation art and bring a new audio-visual experience. Virtual reality technology is one of the important media for the future animation art form update, its combination will better adapt to the diversity experience and personalized needs of users in the future artificial intelligence era [3]. Some experts have also studied VR virtual reality technology, which has brought new development forms for art museums. Art museums use virtual reality technology as a powerful force to promote physical art museums. The perfect combination of virtual reality technology and Art Museum expands and extends the functions of physical Art Museum such as display, collection, dissemination and education. The virtual art museum has changed the space-time relationship between the audience and the collection, increased the way of viewing between the audience and the art museum, so that the audience and the works have more interaction, so that people can obtain exhibition information timely through terminal equipment, such as mobile phone, computer, tablet, etc. From the perspective of Art Museum, virtual reality technology has changed the display mode of Art Museum, disseminating information in multiple directions, and providing a larger information platform, so that more people can feel the charm of art [4]. Although the research results of VR virtual reality technology are quite fruitful, there are still deficiencies in the development of VR virtual reality technology in painting.

In order to study the application and development of VR virtual reality technology in painting, this paper studies the application of VR technology in response surface method experiment, and finds the commercial value of VR painting technology. The results show that virtual reality (VR) can create painting art.

2. Method

2.1 Application of VR Technology in Response Surface Methodology Experiment

This paper reviews the application of response surface methodology and VR technology in absorptive modeling and optimization. The theoretical background and application program of the method discussed are described. The most commonly used experimental designs, their limitations and typical applications are introduced. How to determine the accuracy and significance of model fitting is also introduced. In addition, the references for modeling and optimizing absorptive using RSM and ANN methods in recent years are also introduced [5]. Special attention should be paid to the selection of factors and responses, as well as the statistical analysis of modeling results. The application of VR technology in response surface methodology (RSM) optimization experiment design can theoretically guide the experimental optimization and provide optimization design for exploring new technology in actual production. This method can be used in medical chemistry, life science, film and television culture and other fields [6]. It has a certain theoretical guiding significance and practical application value for the optimization of experimental design, and provides a new research idea and method for experimental optimization design. For example, suppose an experimenter wants to find out the levels of temperature ($x_1$) and pressure ($x_2$) to maximize the yield ($y$) of the process. The yield is a function of temperature and pressure levels, for example

$$y = f(x_1, x_2) + \varepsilon$$

(1)
Where $\epsilon$ represents the observation error or noise of response $y$, including uncontrollable adverse factors and model fitting errors. If the expected response is $e(y) = f(x_1, x_2) = \eta$, then

$$\eta = f(x_1 + x_2) \quad (2)$$

2.2 Commercial Value of VR Painting Technology

VR painting has attracted a lot of attention in the industrial chain of production and communication, so if it is hot, it has value. At this stage, domestic and foreign technology companies, Internet companies, film and television companies are focusing on the development of virtual reality technology and content production, while the United States is still dominant. At present, a large number of VR painting content is released by foreign painting studios and VR platform. China has a large consumer market and many Internet companies, and the Chinese market has a strong potential. Only when many advanced technologies arrive in China and face such a huge market, can they be commercialized [7].

For example, high-speed rail technology was first produced in Germany or Japan, but their market is too small. It is only a matter of time before China's high-speed rail technology can surpass them. Similarly, the virtual reality technology is still very young, and the market in China is very large. Therefore, practitioners need to constantly explore, constantly tap the experience needs of VR painting, create greater value, and create high-quality VR painting content [8]. Through good experience to feedback the maturity of virtual reality technology, improve hardware equipment sales at the same time to achieve mutual promotion, and create greater commercial value in the process of VR painting production, dissemination and experience.

3. Experience

3.1 Extraction of Experimental Objects

VR virtual reality technology extraction is mainly to extract its features. Traditional feature extraction methods mainly include texture structure extraction, color difference selection, structure feature extraction and orientation feature extraction. In this chapter, aiming at the complex factors such as the diversity of VR technology objectives, the uncertainty of information and data, as well as the problems existing in the interactive design extraction of VR technology, the compensated fuzzy interactive design is introduced into VR virtual reality technology extraction, and a VR virtual reality technology extraction method based on compensated fuzzy interaction design is proposed. In this paper, the network structure conception, membership function establishment, sample creation, feature selection and selection, model construction and other related issues were deeply studied, which laid a theoretical foundation for the next step of experimental practical application [9].

3.2 Experimental Design

The CNN model structure extracted by feature method can be divided into three steps: the first step is interactive design pre-processing, including edge preserving relaxation filtering and pixel block extraction; the second step is virtual technology feature extraction; the third step is feature fusion classification. Because ape can mines the effective information in the original spectrum and lacks spatial information, if the denoising is not carried out in advance, the CNN model structure is divided into three steps, On the other hand, it can make up for the lack of spatial information of each pixel, or extract the spatial features of each pixel better than the single feature in the space. In order to verify the validity of the model, two public data sets, namely, kindness and gregariousness, were selected for comparative experiments. Then the noise interference features are denotative to improve the classification accuracy. If the noise is not preprocessed, the noise is too large, which makes the neural network unable to learn the features we want, so the classification accuracy is very low. Finally, a comparative study is carried out.

3.3 Statistical Analysis of Data
Mathematical statistics: use Excel data processing software to analyze and statistically process the relevant data, and present them in the form of charts. The formula is as follows:

\[ \text{SUMIF}(A2, G2, A3:G3) \]  (3)

4. Discussion

4.1 Current Situation of VR Painting

In the past for VR technology in the field of painting research, technology has not been paid attention to, but now the development of science and technology era, technology has become an important and emerging topic in research. In the study of painting, the first premise is to understand what beauty is. Pythagorean School holds that "beauty is the harmony of numbers"; Kant's critique of judgment believes that "beauty is a pleasure object with nothing to do with everything". Plato thinks that beauty is self-contained and always with itself. Scholars have never stopped the debate and Research on beauty, and the aesthetic of technology is a part of the study of technological beauty. Since the 1980s, China has made some achievements in the study of technological beauty. From the vertical perspective, the research gap of technological beauty has been filled, and the quantity and quality of research are constantly improving. From the horizontal point of view, it is the prosperous period of foreign research on the beauty of technology from the beginning of the 21st century to the 1970s and 1980s, but it is a period of decline after the 1990s. However, in China, it is rising rapidly, and constantly expanding the theoretical exploration, putting forward many related new problems, and gradually forming the research of technological beauty with Chinese characteristics. Although there have been fruitful achievements in the research on the beauty of technology in Chinese academic circles, we can't think that these studies have been perfect. There are still many problems to be further studied, and many related new topics need to be explored. Especially in the practical application discipline, the research on the beauty of technology is relatively small, and it has not yet formed a systematic guiding theoretical system, and it is only staying in the theoretical level of philosophy. The key word "VR technology" was searched in CNKI database, and a large number of articles were about the application of VR technology in different fields, which showed a straight-line upward trend in recent years. For VR technology in the field of painting related research, mostly for the feasibility of VR technology in painting, practical application, creation and other impact research. However, there is little analysis of VR technology in painting. In the past ten years, the research on VR painting is on the rise, but the number is not very large [10]. As shown in Table 1.

| Year trend of VR technology publication |
|----------------------------------------|
| Particular year | 2010-2011 | 2012-2013 | 2013-2014 | 2015-2016 | 2017-2018 |
| Number of published articles | 9 | 13 | 20 | 26 | 54 |

Table 1.
The large-scale VR equipment based on spatial positioning is the most complex system among the three types of VR devices. As a completely free person, the user exists in the virtual world, and interacts with the virtual space visually and with the physical space perceptually. According to the survey of three kinds of people (regular people, people with mobility disabilities and teenagers), we found that the number of people who use interaction design is the most common, and the number of people who use interaction design is the least. As shown in Table 2.

Table 2. Statistics of the number of people using interaction design among different groups

| Crowd                  | Percentage | People with limited mobility | Young people |
|------------------------|------------|------------------------------|--------------|
| Number                 | 73         | 21                           | 56           |
| Percentage             | 48%        | 14%                          | 37%          |
With the rapid development of science and technology, people's living standards are generally improved, which plays a very important role in our future life. Nowadays, we are living in a fast-paced era dominated by information. Heavy and boring instructions inevitably become a burden before using electrical appliances. In addition, it is a kind of painful sadness in the regular population, the constant action group or the youth group. However, the rise of human-computer interaction design has solved these problems well. It shows all aspects of the product in the form of 3D animation. In addition, in order to let users have a more direct experience, some film design companies introduce interaction technology into it. It is this direct interaction that not only brings novelty, favor and trust to users, but also shortens the distance between products and users. Therefore, in the design of Smart Home 3D demo animation, we should explain the animation products and interactive design from the perspective of users, and make the demo animation more functional and interesting through some simple actions.

5. Conclusion
Tilt brush, a virtual reality (VR) painting application developed by Google, is an impressive digital 3D image creation tool, providing new possibilities for art creation and creative industries. At present, due to the high cost of purchasing virtual reality system and the physical space needed to run it, tilt brush is far from popular. This means that on the one hand, only a few creative people have access to the app, and on the other hand, their artwork is inaccessible to most people unless reduced to a two-dimensional experience. However, if the images generated in virtual reality are to be transformed into paintings, the 3D dimensions of these products can be preserved and experienced without the use of virtual reality headphones, which will make them accessible to the wider public. This paper introduces the process of the combination of vr virtual technology and realistic painting, as well as the difficulties encountered in the implementation process.

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