Application of Digital Media Technology in 3D Animation Design and Production

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Abstract: With the continuous improvement of technology, all industries are advancing under the influence of the Internet. Nowadays, the development of digital media technology has become more and more mature, and its application in 3D animation design is also more extensive, which can realize the combination of digital technology and art while improving the effect of animation display and dissemination. This paper elaborates on the application of digital media technology in 3D animation design and production, and designs a new 3D animation system to enhance its realistic effect.

1 INTRODUCTION

Nowadays, digital media technology is widely used in various fields, and it has a great influence on animation design, which not only can realize resource sharing, but also can break the traditional production mode and integrate science and art, which has a great impact on the development of society.

Nowadays, people have higher and higher requirements for quality, and so does animation design. People are no longer satisfied with the traditional two-dimensional animation, but pursue the high definition and realistic three-dimensional animation. The diversification of scenes and cross-visual interaction of 3D animation can bring better experience to the viewers and greatly improve the efficiency of designers, both in terms of animation scenes and lighting effects, which will be further enhanced. In this paper, the application of digital media technology in 3D animation design and production is studied and analyzed, and through digital media technology as the basis, some virtual reality technology is used to design a simple 3D animation system, and through experimental performance the application effect of virtual reality technology in 3D animation system is significantly improved, and the vivid restoration of the real scene is realized.

2 THE MAIN CONTENT AND REQUIREMENTS OF DIGITAL MEDIA TECHNOLOGY

Digital media technology is a kind of application technology based on information multimedia technology, which is the process of processing digital media information, not only rich in expression, but also high in efficiency.

Digital media technology also includes a variety of related science and technology and information, such as information processing, graphic design and animation design. There are many courses that need to be learned, such as Photoshop, 3DSMAX, Maya and post-editing art courses, as well as JAVA design, C language and animation technology and other computer courses. Nowadays, digital media technology has been widely used in various fields, and in the field of animation design is also very prominent, it can not only break the traditional production mode, but also can bring a different audiovisual feast to the audience.

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3 THE DEVELOPMENT OF THREE-DIMENSIONAL ANIMATION DESIGN AND MANUFACTURING

With the support of science and technology, animation has been transformed from two-dimensional to three-dimensional, three-dimensional animation is produced by using special technology, compared with traditional animation, the manufacturing process of three-dimensional animation is relatively demanding, the essential thing is to ensure the light effect, so as to ensure the realistic visual effect. In addition, professional software must be used to achieve the realism of the plot and improve the texture and effect.

Most of the 2D animation is designed in the form of a single line, compared to 3D animation, which is much more complicated, including lighting design, model construction and animation generation. This digital media technology breaks some of the traditional limitations and makes the story better narrated through special effects, which makes the story more layered and infectious.

4 THE APPLICATION OF DIGITAL MEDIA TECHNOLOGY IN THE DESIGN AND PRODUCTION OF THREE-DIMENSIONAL ANIMATION

Digital media technologies are well established as a way to improve quality and detail, and to shorten production time and increase efficiency. Although there are many factors to consider, there are no particularly difficult procedures, so it is easy to use and further improves the overall quality and efficiency of the production. In the face of the continuous development of animation design, people's demand for it is also showing an increasing trend, so it seems that the development of digital media technology has an important influence on the production of animation design.

4.1 Special Effects of Light and Shadow Art

Light and shadow effects are generally achieved through 3D technology to form a double effect of shadow and light, and to achieve the art of light and shadow, it will be superimposed frame by frame. The continuous change of light and shadow can fully show the atmosphere of 3D animation and make the audience have emotional resonance. This effect is also a kind of real feeling, which can reflect the inner world and activities of the characters, and is more suitable for the psychology and emotion of 3D animation, so it has been recognized and widely used in its field.

4.2 Special Effects for Conversion Shots

The conversion lens effect is the so-called lens effect, which can enhance the effect of the picture when the picture is changed, and adopt a more vivid and rich language form to express the animation content. In the process of its use, the most important thing is the lens effect, analyze the position of 3D animation in the scene, find a reasonable and prominent position, so as to improve the overall level of the picture and the ability to express. In the picture, the transition between the character and the environment is very crucial, and the transition lens effect can make the 3D animation distinctive, realistic and high quality through its quality.

4.3 Special Effects in Spatial Dynamics

The spatial dynamic effect has a close relationship with the establishment of 3D animation, both in the general embodiment of animation and in the objective expression of space play an important role. The characters shaped by 3D animation technology can move from different positions and directions, fully showing the dynamic spatial effects, enhancing the story's infectiousness and realism. This will also be closer to real life, so that the quality of three-dimensional animation to a whole new level.

4.4 Special Effects in Interaction

Interactive effects in 3D animation allow characters to blend with the environment to create unique scenes and increase their realism. Although it is developed from the basic design, it can make the characters move in a clear and realistic way by shaping the characters in all directions. This approach will allow the audience to be more engaged. Good animation cannot avoid the support of digital media technology, and combining art and technology is both an advantage and a breakthrough. When the designers integrate their own ideas into

their works, how they present them is particularly important. The emergence of digital media technology is undoubtedly a good assistant, so that more good animation works are presented in front of the audience.

5 DESIGN OF THREE-DIMENSIONAL ANIMATION SYSTEM BASED ON DIGITAL MEDIA TECHNOLOGY

5.1 System Hardware Design

The hardware design of 3D animation system is improved on the basis of the original one. In the process of running the system, it is necessary to choose a suitable server and a matching server skeleton according to the node rule, so as to ensure the high efficiency of the animation in the production. Regarding the node problem, it is necessary to extract the material on the server before the next step of production, and finally store the obtained results to the file server.

In order to avoid lagging due to large internal nodes, RAID technology is added to the file server to improve memory performance and efficiency. A stable network channel can be achieved by using a multi-port server network card. At the same time, VR equipment is combined with 3D animation design to provide an interactive environment for the production of animation. (Cao 2020)

Table 1: 3D animation design system hardware configuration.

Hardware	Configuration	Features
Embedded Server	Quad-core 2.56 GHz CPU, 8 GB RAM, 500 GB hard drive	Content Management
System operating processor	Intel Core Duo, Intel Core Duo Windows 8.1 system	Digital Media Technology Applications
Database Server	Quad-core 2.75 GHz CPU, 4 GB RAM, 500 GB hard drive	Storage Data
Monitor Resolution	Resolution 1,280 x 1,024. 64-bit video card	Show production content
Sound Cards	ASIO compatible sound card, 24 bit	Sound Playback

The hardware equipment also contains some hardware facilities, which are necessary to handle the program data and graphics files of 3D animation. These include the management server, 3D animation server and processor, etc. (Xie 2018) The specification of the management server is Shine Server R1080×d 2×pay strong B6-651Q, and the specification of the 3D animation server is Shine Server R7202×1 NTEL X EoN, DDR3 memory, E5-7180 V2, 1×600 GB SATA hard disk. Shine Server MBoX 6000-B 3D animation system supports direct or indirect submission from 3DMAX, Maya and other software, and can automatically adjust the material. The structure of the processor is shown in the figure 1. (Wang 2020) In terms of VR equipment, the brand chosen is LEGO.
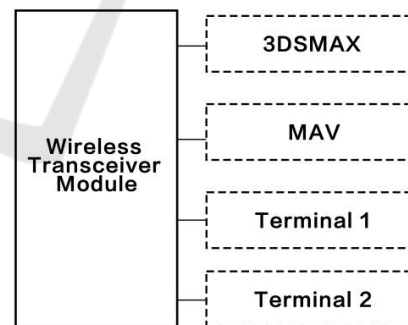

Figure 1: Processor architecture.

5.2 System Software Design

With the continuous development of network technology, software tools with powerful functions have emerged. The principle of 3D animation design system is to input the design created by the designer into the system, and then process the base image through digital media technology, and finally carry

out various modeling work according to the base, and then complete the design of 3D animation.

5.2.1 3D Animation Base Image

The anime sketch is a rough design of an anime character that the designer draws by hand and presents it in lines. After the base drawing is completed, it is scanned and imported, and then processed using digital media technology. First of all, to distinguish between the character and the environment, the background is stretched with a histogram. Then, the details of the image are recovered using the wiener filter recovery method. After processing, the feature parts of the image need to be extracted and then the color features are classified according to the statistical retrieval method. Finally, the texture features are extracted using the symbiotic matrix method, so as to make the modeled image and scene more realistic.

Let $I(x,y)$ be the processed negative image with a gray level of N. Take two points of the image (x, y) and $(x + x_1, y + y_1)$, and the gray values of the two points are (g_1, g_2), then there are N^2 combinations of gray values (g_1, g_2) in the negative. (Li 2018; Hou 2017) After normalizing these grayscale values into an $N \times N$ matrix, the grayscale co-occurrence matrix is generated from the probability $P(g_1, g_2)$ of selecting each grayscale combination as shown in the following equation:

$$P_d(g_1, g_2) = \begin{bmatrix} P_d(0,0) & P_d(0,1) & \cdots & P_d(0,N-1) \\ P_d(1,0) & P_d(1,1) & \cdots & P_d(1,N-1) \\ \vdots & \vdots & \ddots & \vdots \\ P_d(N-1,0) & P_d(N-1,1) & \cdots & P_d(N-1,N-1) \end{bmatrix} \quad (1)$$

The corresponding matrix can be generated from the base according to the gray co-generation matrix, and the corresponding feature vector can be obtained by scanning the degree co-generation matrix in one direction. Using the mean and variance of the feature vectors, texture feature extraction can be completed. Finally, according to the results, the reasonable modeling is then performed.

5.2.2 3D Animation Character Modeling

In animation, character and scene are the two most important parts. The character is the soul of the

work, and the population model generation method is used in character modeling. The initial character model is created by modeling software, and then the structural lines of the model are scaled by genetic algorithm. As shown in Figure 2. (Sun 2020) After obtaining the character prototype and action library, the user can choose the character according to his needs and make simple parameter changes to obtain a unique anime character.
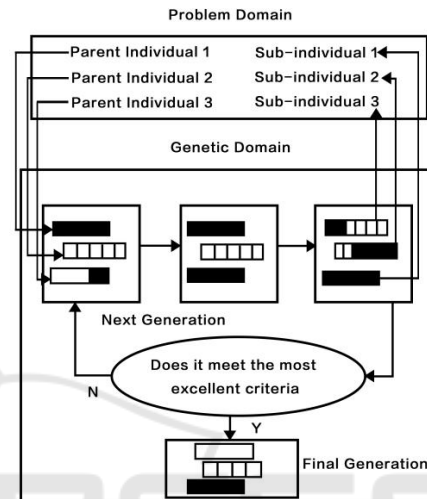

Figure 2: Genetic algorithm tuning model process.

5.2.3 3D Animation Character Simulation

The character's movements are captured and stored in a motion library based on motion capture technology, and then displayed through virtual synthesis software, where the user can change the movements according to the storyline. The user can change the movements according to the storyline. The new movements are verified according to the Newtonian Eulerian motion model to see if they are reasonable.

The 3D animation system sets the character action as $motion(t)$, and the new character $posture(t_i)$ can be obtained by changing the original character $posture(t_i)$. The size of the user window is $F \times G$, and the character model can be moved with the mouse. When moving, the change in the f-direction is Δf, and the change in the g-direction is Δg. Through Euler's theorem, it can be deduced that the Euler angles $< \alpha, \beta, \gamma >$ represent the rotation in the d,f,g directions:

$$\sin \alpha = a \Delta f F (1- a) \Delta g G$$

$$\sin \beta = b \Delta f F (1- b) \Delta g G \quad (2)$$

$$\sin \gamma = c \Delta f F (1- c) \Delta g G$$

Where: a, b, c are the influence factors, which represent the influence of Δf and Δg on the Euler angles $< \alpha , \beta , \gamma >$ in the three directions of d, f, and g, respectively. The latest pose posture of the character model is obtained by calculation, and the simulation of 3D animation character modeling can be carried out.

5.2.4 3D Animation Scene Modeling

3D animation scene modeling is to use computer graphics to build a 3D geometric model of the virtual scene in the form of polygons so that the real scene can be abstracted. The content includes scene lighting and material, with the terrain and architecture for processing. This geometric modeling method to build a relatively realistic scene, the operation is simple, only need architectural drawings to build a virtual three-dimensional scene in proportion.

5.3 Experimental Analysis

According to the interactivity, immersion and image presentation of animation, 3D animation is compared with traditional animation, and the effect of 3D animation system based on digital media technology is significantly improved.

5.3.1 Experimental Parameters

The parameters of interactivity, immersion, and image presentation in the experiment were obtained by voting based on a population sampling experience.

Table 2: Experimental test parameters.

| Projects	Parameters
Interactivity/ People	100/0
Immersion/ People	100/0
Image presentation/ People	100/0
Sound / People	50/44
Production time comparison/h	8/15

5.3.2 Experimental Procedure and Conclusion

After the experiment, the users will vote for the form they think is effective and preferable, and the voting

result will determine the comparison result of the experiment.

According to the experimental results, as shown in Table 3. The 3D animation is more popular among the experienced users, satisfying their aesthetic preferences, and the system is also smooth and has improved efficiency and stability in the production process.

Table 3: Experimental test parameters.
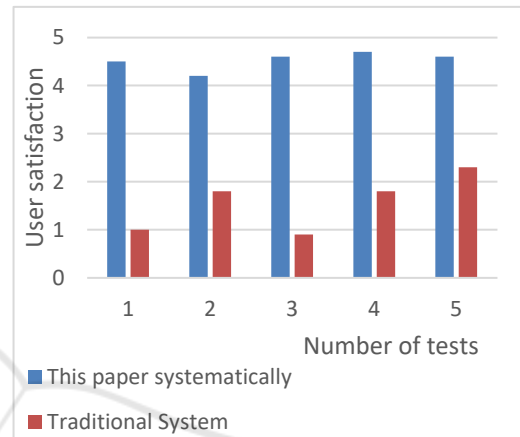
The system designed in this paper can contribute to the development and production of animation. It also shows the application of digital media technology in the design and production of 3D animation, but the system needs further improvement in some aspects.

6 CONCLUSIONS

Along with the continuous development of computers and software, the development of 3D animation is also intensifying. Although it is a virtual world created, but the excellent animation works are very influential. The integration of digital media technology and art can not only bring new impetus to the development of 3D animation, but also make the means of communication more diversified. The animation design system under the application of digital media technology proposed in this paper is only a small beginning. In the face of the future development of three-dimensional animation, designers need to make full use of their own advantages and characteristics, improve the quality of creation, enhance market competition, so that it has a broad application prospects.

ACKNOWLEDGEMENTS

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