

Research on the application of digital media art in animation control based on Maya MEL language

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Abstract. Digital media industry is a modern industry produced by the media, network technology, intelligent terminal technology and joint cultural industry, and has been applied to many fields at present. Thus, in this paper, in order to study the application of digital media technology based on Maya MEL language in animation control, from the point of view of the form of digital media art work, and combining Maya production practice, the technology of controlling character animation in MEL language was selected, and the solution to the problems encountered in manual animation control was studied. The final experimental results show that digital media can show the effective representation of digital media art in Maya design, so as to meet the target audience's cognitive law, and to achieve the effective dissemination of knowledge in the era of digital communication.

Key words. Digital media art, 3D animation, Maya MEL language.

1. Introduction

Digital media art is not only a technology but also an art, which is formed by the integration of many disciplines, covering the computer image processing technology, multimedia technology, art design and other technologies [1]. It is mainly divided into three categories: firstly, from the perspective of its overall connotation, computer technology runs through the whole design process. And the software and hardware facilities are integrated to carry out the creation, with the form of art to show the quality of the data to create a sense of beauty. Secondly, from its application, huge data is optimized, which is depicted by computer technology in a more appreciative manner, breaking through the traditional mode of creation. From the perspective of application trends, the third one is to use computer technology, network technology, 3D printing technology, intelligent identification technology, and mobile communications software and hardware equipment to simulate and com-

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pound works of art. Therefore, even if a large amount of data is missing in the process of making works of art, the original form of the artistic expression can be restored through the integration of multi-information data and multi-dimensional technology [2]. The combination of computer science and art design has produced the subject of digital media art design, which has many important effects on human beings. With the help of digital media technology or electronic media technology, industrial design products and art works can be displayed perfectly. Through the emerging media such as mobile phones, CD-ROM, the Internet, people can watch works easily and quickly. Multimedia web pages and interactive packaging art bring people good visual experience [3]. More than a result of technical creation or the repeated superposition of some forms of artistic creation, the creation of digital media art is built on the basis of artistic creation through a series of forms such as rewriting, reconstruction and renewal. In the aspect of art, it not only has its own unique significance, but is also reflected in the modernization, basic form and basic theory of aesthetics [4]. The digital media is becoming more and more popular in our daily life, which gradually integrates the mass culture and has the function of serving the society. The design of digital media art covers many subjects such as computer technology, media technology, art, design and so on [5].

2. State of the art

2.1. Present situation and development trend of digital media at home and abroad

Through the use of information technology and digital technology, and with the help of the carrier, digital media can spread the information through audio, video, text, pictures and other forms of media expression. With the rapid development of science and technology, the development of computer science and digital media should not be underestimated. Nowadays, the mass media has changed a lot [6]. The new digital media has gradually replaced the traditional media, and is rapidly moving towards digital. The development of digital video, audio, film and so on is also very fast. At present, digital media technology has penetrated into every field of life. Culture, education, economy, management and so on need the use of digital media, especially in the field of art. The appearance of digital media has greatly increased the form of art diversification. The process of digitalization of communication information refers to the processing of information collected, so that the form and content of communication can be digitized. Therefore, the digital media has become the latest information carrier after the language, the text, the picture, the electronic technology and so on [7].

With the development of the culture and communication industry, and their demand for high-tech applications, in recent years, the development of digital TV technology, communication technology and computer network technology has promoted the development of multimedia industry and cultural media industry. The multimedia industry has gone deep into cultural education, art design, entertainment and publishing, economic management and other aspects. And the combination of

digital media and computer, film and television, education has promoted the growth of knowledge economy. The multimedia industry in China starts relatively late, but the development speed is very fast. In particular, the development prospects of creative companies with high technology and culture are very optimistic [8]. The multimedia industry has also made a great contribution to the national economy. In the past ten years, the registered animation and related industries in China have expanded from a few hundred to more than 5 thousand, gradually forming the animation industry chain, providing jobs for nearly ten thousand people. The rapid development of small and medium sized enterprises in China and the introduction of transnational capital have injected fresh blood into the information economy of our country. The multimedia industry has played an important role in the sustainable development of economy and the adjustment of economic structure in China.

2.2. Application of Maya and MEL language

The most influential 3D animation software Maya is designed by the American Autodesk company, which is suitable for the design of movie special effects scene, character animation and video advertisement. The software is simple and easy to use [9]. Maya is more perfect than ordinary 3D visual effect. Combined with the forefront of cloth simulation digital, hair rendering, modeling and other technologies, realistic rendering can be enhanced. It can be said that Maya is the most professional film making software. In today's tools for digital and three-dimensional production, Maya can be run in a common operating system to become the first choice for the development of three-dimensional animation film and television works. There is an enhanced Script called MEL. And Command language is the core engine of Maya software, which is a kind of embedded language in Maya, belonging to a kind of command and script language. The purpose is to enable the user to control the Maya commands as well as working procedures and processes [10].

The basic architecture of Maya is provided by MEL, and all of the key points in the software are from MEL commands and scripts. MEL extension and Maya functions can be used to further develop the software to meet the needs of users more practical. In addition, MEL can also directly control the Maya command, work procedures and processes. Because each function and operation of Maya are written in MEL program, every time a Maya operation is equivalent to the implementation of a MEL [11]. MEL is the foundation of the whole Maya software. By using the features of MEL and Maya, the designer can define and extend the function of Maya software. The MEL language in Maya is a platform that contains a number of built-in functions and commands. These functions and commands belong to the upper level [12]. Because each function in Maya is achieved through the MEL language, all command buttons in the Maya interface are controlled by the MEL language. Through the MEL language, the menu command in the Maya interface can be used more conveniently, and more properties of Maya can be accessed. MEL language is a very flexible language, and thus animators can even use the MEL language to edit their own widgets or menus.

3. Methodology

3.1. MEL language features

In the Maya software, the instruction set and the function are the essential components in the creation process. At the same time, MEL language will also be used to write and define the collection of procedures required. There are five main functions.

Firstly, the process controller of the scene state and the scene modifier is created to provide the corresponding method for the control of the scene animation and the modification of the object. Secondly, the realization of interactive control of the program depends on the command line window and the monitoring window [13]. Thirdly, the scroll bar of the working interface is mainly to implant the preparation of MEL language, so as to provide a more standard Maya user interface for MEL. Fourthly, its user input/output tools are created primarily by inserting the I/O file. Finally, it has many features of the Maya software, such as the construction model, lamp settings, animation editing, texture, rendering imaging.

3.2. Construction of 3D animation model based on Maya MEL language

It is a very important work and technology to build 3D model in Maya, which is the basic condition of 3D animation. Maya software modeling technology includes the following: paint (brush) modeling, Nurbs (surface) modeling, Polygon (polygon) modeling, Subdiv (subdivision) modeling and modeling of some special technologies. And material, lighting, rendering and other operations will be based on this [14]. In general, the creators will rely on Maya software modeling technology to complete the physical entities, such as people, animals, objects, scenes and even natural landscapes and other shapes of animation, then which must be translated into a digital computer language. In fact, the scene of Maya is a database of some computer languages based on numbers. The above information will be interpreted by the Maya script interpreter, and can be displayed on the computer screen with a friendly and visual interface. It is intuitive and convenient to build a model in a general interaction in the Maya software. However, when multiple objects are repeated, the use of MEL language to create a model will have a unique advantage, which is not only more convenient, but also can be used to create, edit and modify the properties of 3D objects when the precise control of the model is strictly required.

3.3. Analysis of the principle of dynamic animation with MEL language system

Another important function of the MEL language in the Maya software is the establishment of the property map (Dependency graph/DG) node. In order to achieve the special effect, the scene playback must depend on the connection between the nodes. At the same time, MEL language and animation elements are closely linked in Maya software. Then, the main effect of MEL language is to control the properties of the object, using the equal sign to assign the object attributes [15].

In the creation of animation, nodes establishment, node connections and other operations were carried out on the back end. In the case analysis, the monkey was chosen as the experimental model, as shown in Fig.1. Each monkey in the scene would appear in the three interrelated nodes, make Nurb Baby1, NURB Baby Shape1, and NURB Baby1.

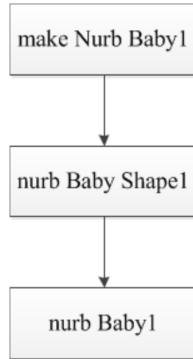


Fig. 1. Node of the monkey

As can be seen in the Maya software, the creation of attributes and prototype animation operations were equipped with more complex meaning. The MEL language can also simplify the work of node network. The definition of MEL in Maya was more complex than the simple attribute value connection. Its working principle was as follows: a new MEL expression node was created by using the input value of the channel bar or the expression editor, including the expression script. At the same time, the calculation method of the data can be output/input. Instead of making a big change on the whole, only changing the first node and the second node can rebuild the calculation method.

4. Result analysis and discussion

The use of MEL language control can simplify the transformation of the role model handle. Similarly, it is very effective to use the MEL to simulate the motion of the individual in the process of dynamic individual expression. Language was used to simulate dynamic process, and MEL was used to identify the movement process of the individual, including the change of the movement rules and the influence of the mass on the movement. MEL language was adopted to simulate the dynamic process of monkey tail skeleton, so as to realize the control of a certain characteristic image in many images.

As shown in Fig.2, the monkey tail skeleton model was constructed. It was assumed that the tail skeleton was a six segment active connector, and six linked modules were built to simulate the skeleton. The monkey's body was constructed, displayed as a square script and connected to the skeleton module.

Before the measurement and control, the value of the acceleration of the square script in the direction of x , y and z , as well as the value of the square script itself

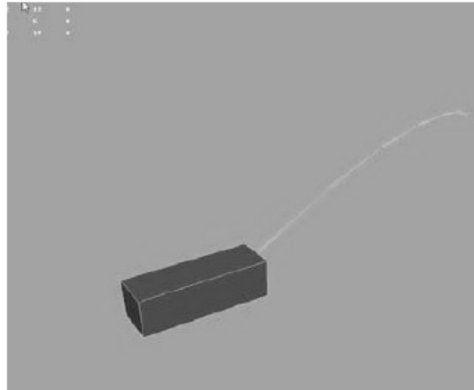


Fig. 2. The model of monkey skeleton

were determined.

The control of monkey tail was realized by the acceleration of the six modules connected with the square body. Therefore, the acceleration of the square body along the x , y , and z directions was represented by a name. In addition, a sensitivity parameter K was added. The parameter K was used as an independent variable and was expressed in MEL design language. Then the K property was bound to somewhere in the six module. Through the change in the size of the K value, the actual value of the control speed was increased, and the adjustment and control of the tail sensitivity were realized. Figure 3 showed the effect of applying it to a monkey model.

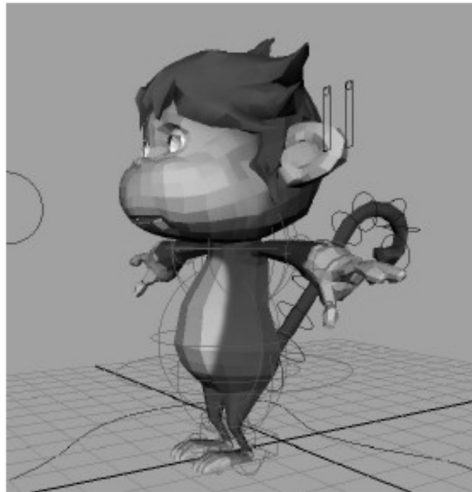


Fig. 3. The effect of applying the control to a monkey model

The numerical values that required to be expressed in MEL language were mainly the numerical values of the dynamic characteristics, including the velocity, angular

velocity, direction and speed of the body. The way of numerical transformation was to express partial direction change of body by the relationship among the value, direction, and velocity of angular velocity. Moreover, the value of the direction change of the angular velocity can indicate changes in this direction. At the same time, the increase of velocity in the x direction and y direction can be calculated by the accumulation of body velocity. Through the calculation of the change of velocity and the value of the direction, the expressions of x direction and y direction were realized.

As shown in Fig. 4, other bones were basically the same, but the difference was the correction of individual parameters. It should be noted that the above mentioned 1.5 of the formula was the length of the first skeleton of the monkey. And with the actual situation of different bones, other joints can make different changes accordingly.

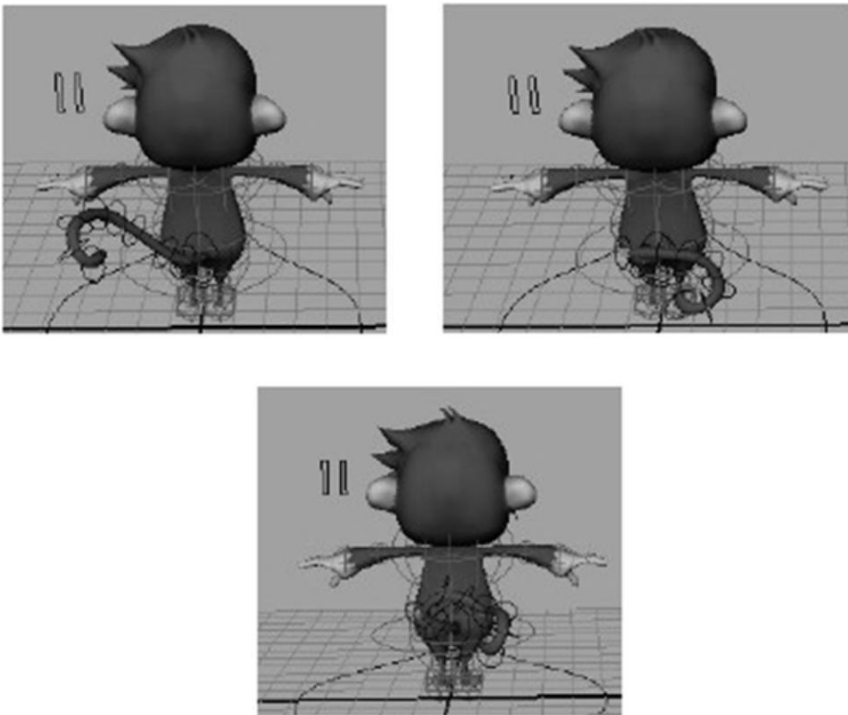


Fig. 4. The effect of applying the control to a monkey model

When using MEL language to simulate the dynamics, different precision requirements should be determined according to different simulation objects. The six modules connected by the square represented the monkey tail bones. Due to the special nature of the creature, the monkey will often roll tail, and swing tail. Therefore, the MEL language model was only suitable for expressing the dynamic motion of the tail with small amplitude. In order to realize the dynamic simulation of high curvature, the MEL precision control was needed.

5. Conclusion

With the development of digital media, the relationship between the Internet and the IT industry is getting closer and closer, which will become an important force in the development of new media industry and promote the development of the whole industry in the near future. Based on this background, MEL language was used as the development language design, and the three-dimensional animation was developed in this paper. Moreover, combined with specific examples, further study and research on the strategies and methods of 3D character animation design were carried out.

The functions and features of MEL language were analyzed in this paper. The method of producing animation with MEL language system was written. And MEL language simulation and animation control were described in detail. On this basis, the method of animation control in MEL language was summarized, and the advanced theory of MEL language control animation was obtained. Through these methods, the problems existing in the traditional animation were solved effectively. Then the basic theory of 3D animation and the architecture of the whole system were clearly recognized. Based on the function and structure of computer 3D animation, the analysis was carried out from the aspects of character animation, motion editing and so on. When the model was created in Maya software, the MEL language was used to control the action. Through the MEL language programming, Maya character animation was produced, and group animation control system was also set up. Finally, all previous research results and processes were summarized, and character animation control system was designed and implemented.

However, due to the limitations of professional standards, there are still many problems in the MEL programming language and Maya animation, thus needing further studying in the future.

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