Proceedings of the 2023 International Conference on Machine Learning and Automation
DOI: 10.54254/2755-2721/34/20230327

Review of computer animation technology and its applications

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Abstract. The development of three-dimensional space into four-dimensional space can make film and television more attractive. People complete the thought-provoking creation of video through animation technology, and also enrich and improve the connotation and form of computer animation technology, which has a far-reaching impact on film and television production. This paper analyzes and sorts out the relevant literature on computer animation technology in the fields of film and television. On the basis of summarizing the concept of computer animation technology, this paper explores the application of computer animation technology in television and film and emphatically analyzes the promoting effect of three-dimensional animation technology on the development of film and television, with a view to promoting the development of the film and television industry and film and television works. The results indicate that the application of computer animation technology in film and television production will become increasingly widespread, divided into real-time animation and keyframe animation. Future research will focus on the applicability and precision of animation technology.

Keywords: Computer, Animation Technology, Real-time Animation, Key-Frame Animation.

1. Introduction

When computer technology appeared in people's lives, computer technology was applied to film and television production [1]. Digital processing and synthesis of film and television materials, the source materials are converted into digital film and television materials, and then screened, spliced and processed with special effects, and finally a realistic film and television picture is obtained [2]. Among them, computer animation technology has many contents, a wide range, and rapid development. With further maturity and perfection, the creation of TV movies and so on is more scientific and technological. In recent years, with the update and progress of film and television animation technology, from silent film to sound, from black and white to colorful, from two-dimensional animation to three-dimensional animation, animation technology has experienced a long and long-span development. High-quality masterpieces in China's film and television works have constantly appeared in front of the public. The continuous innovation of computer animation technology has better promoted the development of Chinese film and television works and laid the foundation for the progress of film and television production. Based on existing literature and statistical data, this article provides a relevant review of computer animation technology. On the basis of summarizing the concepts of computer animation technology, this article explores the application of computer animation technology in film and television, with a focus on analyzing the promoting role of three-dimensional animation technology in the development of film and television. The research results of this article are beneficial for understanding

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the current overview of computer animation technology and its development in the film and television industry and film works.

2. Introduction of computer animation technology

Computer animation technology includes 2D animation design and 3D animation design [3]. Generally, the Flash animation and mg animation we make are two-dimensional animations hand-painted through Wordpad, which is the extension of traditional Flash animation, including app animation, public welfare animation short film, legal propaganda film animation, etc. Most of the two-dimensional animation design is used in commercial animation production. The most widely used 3D animation design is in film and television production. Of course, it is also used in commercial animation, such as mechanical principle animation, architectural animation, and other 3D animation. 3D animation design is to complete the computer restoration of real objects through computer technology. We call it 3D modeling, which can accurately and truly simulate virtual reality scenes and is favored by all walks of life [4]. Today's popular 3D movies are indispensable for using 3D animation design technology.

3. Classification of 3D animation

3.1. Real-time animation

Real-time animation, also known as algorithm animation, uses various algorithms to realize the motion control of moving objects. The generation of animation is direct, and the shape in the picture can be moved quickly in an interactive way. The moment of scene selection is the moment of realization, and the result is directly reflected on the computer screen [5].

3.2. Frame by frame animation

Frame-by-frame animation is a common animation form that decomposes animation actions in consecutive key frames, that is, drawing different content on each frame of the time axis and making it play continuously into animation. This unique technology has been widely used and many excellent frame-by-frame animation masterpieces have been made [6].

3.3. Classification of technical dimensions

3.3.1. Key-Frame animation. In Flash, the frame animation representing the key state is called key-frame animation. The so-called key-frame animation is used to prepare a set of time-related values for the attributes that need animation effects. These values are all extracted from the key frames in the animation sequence, and the values in other time frames can be calculated by using these key values and adopting a specific interpolation method so as to achieve a smoother animation effect.

3.3.2. Animation technology based on physical model. Animation technology based on physical models uses physical models to generate realistic motion. The animation technology of physical models adopts the dynamic principle of the movement effect of movable organisms, which is a three-dimensional modeling and motion simulation technology with potential advantages in graphics [7]. Different from traditional animation technology, physical model animation technology can simulate all kinds of natural phenomena, and its calculation complexity is high, so it is often applied to film and television works.

3.3.3. Rigid animation and human body animation. The rigid animation controls the positions of multiple meshes, and the key frames record the position information of each mesh. Human body animation is a computer animation technology that realizes human modeling and simulates human behavior through computers. It appeared in the 1980s at the very beginning and kept developing in many areas. Now it is widely used in film and television stunts, sports training and medical and health fields.

Among them, the animation composed of "key frame+middle picture" is called "key frame animation". The work of intermediate painting is to draw the key actions of animation design, that is,

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the changing process between the original paintings, one by one according to the standard modeling of the role, the specified action range, the number of sheets and the movement law [8]. Joint animation and human animation are a large number of degrees of freedom, and the determination of its move techniques for animals with skeletons. The movement of human or animals involvement is very complicated. Each human or animal character has a certain personality. How to extract the parameters describing the personality of the character is the key to joint animation. Joint animation and human animation promote the development of robotics and other disciplines, making it possible for human beings to simulate their own behaviors and actions by computer animation technology.

4. The application of computer animation technology

4.1. The application of computer animation technology in television

In some science and education films, some scientific concepts and principles are abstract and difficult to express by conventional images, but now they can be expressed by animation, such as the perfect presentation of time effects. Compared with the previous animation, the passage of time cannot be shown in the video, but the three-dimensional animation technology changes the speed and flow direction of time passage in animation through linear technology, which has the effect of changing time and space so that people can have empathy experiences [9]. Another example is that the previous TV works are flat and two-dimensional when they are shown to the audience, which will make the audience have a visual limitation when watching movies. Computer technology can transform the characters and scenes in film and television animation into digital images. Animation, with the blessing of special effects technology, can make more realistic pictures and make film and television animation more multi-dimensional.

There are many data points about groundwater movement in the majestic Nanshan. It is very difficult to describe this problem clearly to the audience, and it is also difficult to express it clearly at the macro level. Using 3D animation to show the movement of groundwater is concise, clear and the effect is very good, which can better explain abstract scientific knowledge.

In addition, the clever use of animation can increase interest, increase visibility, and attract the attention of the audience. The combination of popular science and entertainment is more in line with the audience's psychology. Due to technical limitations, it is difficult to display the information of the microworld on the screen for a long time. With the help of computer animation technology, objects in the macro- and micro-worlds can be easily "compressed" or "expanded", and viewers can clearly see the visual images. Greatly expanded the audience's sensory vision and let the audience know more about the scientific mysteries of the unknown world. For example, the origin and extinction of stars in the macro world, gene recombination and cell division in the micro world can be "moved" and made more intuitive using three-dimensional animation technology (as shown in Figure 1)

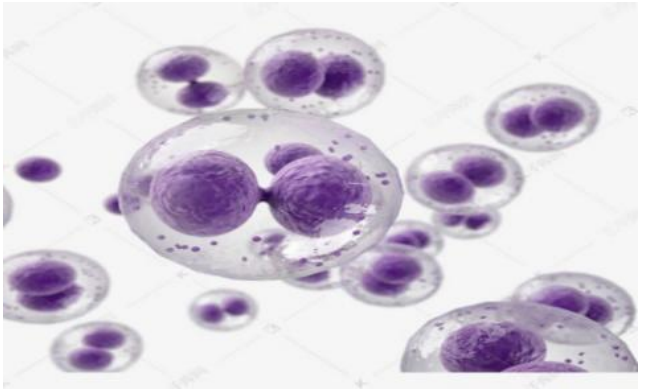

Figure 1. Animation of cell recombination [9].

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4.2. The application of computer animation technology in film

The application of animation technology brings a lot of benefits to movies. Traditional movies and TV shows are only shot by cameras, so it is difficult to complete some special effects, and some special effects are also very dangerous in shooting [10]. In the past, in order to achieve good results in film shooting, only props were used, and some dangerous special effects were unsafe. With the development of animation design technology, it brought a lot of convenience to film and television special effects. General animation design technology is mainly used in the later stage of film and television, and some special effects are synthesized in AE software.For example, many 3D scenes in Avengers 3 were produced inpost-production, and some traditional shooting could not restore these scenes. More than 1,000 scenes were applied through 3D animation modeling. The underwater world scene in the 3D movie Aquaman is widely used in 3D animation design.

With the development of animation design technology, it has more and more influence on film and television, which can save a lot of production costs. Generally, many effects that cannot be achieved in film and television work can be achieved through powerful 3D animation production software. The diversified forms of expression in film and television production are more abundant, and some dangerous actions can be easily realized by 3D animation design. And now the experience of 3D movies and TV shows gives the audience an immersive feeling, which is more popular among young people. Nowadays, 3D movies are the most popular at the box office. It is time-consuming and laborious to shoot some grand scenes with props and scenery, but 3D animation design software is easy to use, and the cost of 3D animation design is very low. Animation design technology has a profound and extensive influence on film and television production [11].

5. Discussion

Human beings should actively lead the development of technology, use animation technology as a tool and auxiliary, and integrate it into all aspects of film and television production, so as to improve the quality and innovation of works and create a richer audio-visual experience. At the same time, it is necessary to actively cultivate compound talents in the computer and film and television industries and promote the sustainable development of computer technology and film and television industries. At present, the development of computer animation technology is getting faster and faster. The future research direction is mainly to expand the application fields of animation technology and research the ingenuity of its own technology, which will be further integrated with other fields, such as physical modeling, art design, etc.

6. Conclusion

Computer animation technology is increasingly widely used in film and television production, and three-dimensional animation technology has brought far-reaching influence to the film and television industry. 3D animation technology is divided into real-time animation and frame by frame animation, and can also be divided into human animation, character animation, etc. according to different modules of the technology. At present, computer animation is widely used in the field of film and television, greatly improving the quality and fun of film and television works. One concern about the findings was that this review paper is based on the theoretical analysis, although is is as objective as possible, it is still highly subjective. Future research will be conducted on algorithms related to computer animation technology in conjunction with relevant experiments, and corresponding analysis and improvements will be made based on the experimental results.

Acknowledgment

Firstly, I would like to show my deepest gratitude to my teachers and professors in my high school, who have provided me with valuable guidance in every stage of the writing of this thesis. Further, I would like to thank all my friends and parents for their encouragement and support. Without all their enlightening instruction and impressive kindness, I could not have completed my thesis.

DOI: 10.54254/2755-2721/34/20230327

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