Explore the possibilities brought by the application of artificial intelligence technology in the field of animation

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Abstract: Today, the animation production industry is facing unprecedented pressure, and the output of animation is increasing. However, the core talents in the industry have not been followed up enough, which has made animation production workers unable to digest a large number of production tasks. How to balance animation productivity and output quality without reducing output needs to be solved. The gradual development of artificial intelligence technology in recent years has brought a new way of solving problems for the animation industry. This article will analyze the possibilities brought by the application of artificial intelligence in the field of animation production, discuss the methods of artificial intelligence participation in production from two aspects of two-dimensional animation production and three-dimensional animation production, and provide more working ideas and methods for animators. This research aims to explore new paths in design disciplines, which will affect design education. Inthe future, educators can focus on the development of students' creativity and find more creative and diverse ways of expressing animation.

Keywords: Artificial intelligence - Animation generation - Animation production - Automatic generation.

[Resúmenes en español y portugués y currículum en p. 194]

Introduction

Animation production usually requires a lot of manpower to invest in repetitive work. In recent years, the gradual development of artificial intelligence technology has brought new ideas to the animation industry to solve problems. Introducing artificial intelligence into animation production will greatly reduce the labor cost of the producer and increase efficiency, bringing more possibilities to the animation industry. This article is divided into four parts. The first part introduces the development process of Chinese animation and the general production process of 2Danimationand3D animation. The second part outlines the concept of artificial intelligence and its historical development and current status. The third part discusses the application of artificial intelligence in 2D. Animation and 3D animation production. The fourth part looks forward to the future development trend of animation. The fifth part concludes that artificial intelligence will bring more technological innovation to the animation industry is undeniable. We have reason to believe that the application of artificial intelligence in the field of animation has unlimited possibilities in the future.

1. Overview of China's animation industry

1.1 The development process and core issues of Chinese animation

The development of China's animation industry has a history of 100 years. Before the reform and opening up, Shanghai Film Studio and Beijing Science Education FilmStudio, as pioneers of original animation, led Chinese animation to international standards. However, since the reform and opening up, due to the Cultural Revolution, Chinese animation has stalled for more than a decade. After that, a large number of foreign animation projects flooded into China. Due to its high production price, a large number of foreign animations were outsourced to Chinese animators, which led to the loss of Chinese original animation talents. This situation continued until early2000. Until 2004, China's General Administration of Radio, Film And Television Issued a series of animation support policies, bringing the domestic animation industry into an unprecedented golden period of development. In 2015, with the rise of the Internet, major video platforms began to rise suddenly, Internet-based animation production increased rapidly, and some excellent works continued to emerge. Since 2015, the Chinese animation industry has entered a stage of rapid development.

With the rapid development of the animation industry, a large amount of capital has begun to enter the animation industry. The rapid inflow of funds aroused enthusiasm and desire of the animation company's market, but it also caused a series of problems. This phenomenon led to the dilution of high-quality production capacity, resulting in a lack of accumulation in the animation industry. The production of the original animation requires a lot of manpower and financial resources. Early creative design, scripts, and storyboards take 1-2 years. For post-production, a 15-minute animation requires a 3D production team of 30 to 40 peoples spend one week to complete. It can be seen that the cost of animation

production is very high, and due to the uncertainty of creativity and consumer preferences, there is also uncertainty in return on investment. Secondly, the core problems facing the current animation industry are that high-end talents with creative thinking are scarce and high-quality content is produced less. Nowadays, the animation production industry has encountered unprecedented pressure and the production of animation has been increasing, but the core talents in the industry have not followed up substantially, which has caused animation workers to be unable to digest a large number of production tasks. How to balance the productivity of animation and output quality without reducing production The problem of enabling animators to devote themselves to the creation of excellent content needs to be solved urgently.

1.2 General production process of animation

Animation production can generally be divided into two ways: two-dimensional animation and three-dimensional animation. The difference between two-dimensional animation and three-dimensional animation does not hinder their respective developments, and there is no alternative trend. They are in a parallel development relationship. The animation production process is very cumbersome, usually divided into three steps: pre-production, middle period making and post-production. The pre-production is the research and development stage of animation, which refers to the overall planning and design of animation before animation production. In Pre-production, the chief animation director is responsible for controlling the main storyline of the animation, script writing, script production, character design, scenesetting, and the necessary production and shooting plan related to these contents.

Middle period making is equivalent to the production stage of animation. The Production process of two-dimensional animation and three-dimensional animation is slightly different. Two-dimensional animation mainly relies on the drawingandcreation of animators, and three-dimensional animation is created with the help of computers. Generally speaking, the main production process of 2Danimationis composition, original painting creation and supervision, animation creation and inspection, coloring, photography, etc. The main production process of 3Danimationis modeling, materials, lighting, animation, camera control, rendering, etc.

The main work of post-production is to output the animation footage, sounds and other materials produced before to the clip software for image synthesis and final editing.

2. The concept of artificial intelligence

2.1.The concept of artificial intelligence

The earliest people who proposed the concept of artificial intelligence (AI) were McCarthy, Minsky and other scientists. In 1956, they met at Dartmouth College in the United States and discussed the topic of "how to use machines to simulate human intelligence." It marks the birth of artificial intelligence.

Artificial intelligence is an emerging technical science that researches and develops theories, methods, technologies and application systems that can simulate and extend human intelligence. The purpose of such a research is to make smart machines listen (speechrecognition, machine translation, etc.), watch (image recognition, text recognition, etc.), speak(speech synthesis, human-machine dialogue, etc.), thinking (human-computer games, proof of theorem, etc.), can learn (machine learning, knowledge expression, etc.), can act (robots, self-driving cars, etc.). Artificial intelligence can simulate human consciousness and thinking process. Artificial intelligence is not human intelligence, but it can think like a human, and may exceed human intelligence.(1)

2.2. Development and status of artificial intelligence

Since the original concept of artificial intelligence was first proposed, artificial intelligence has experienced a tortuous development process of more than 60 years. The development process is roughly divided into 6 stages:

First of all□the initial development period: 1956-early 1960s. After the concept of artificial intelligence was proposed, it has successively achieved a number of remarkable research results, such as the proof of machine theorem and checker program, which set off the first climax of artificial intelligence development.

The second is to reflect on the development period: from the 1960s to the early 1970s. The Breakthrough progress in the early development of artificial intelligence has greatly increased people's expectations of artificial intelligence. People began to try more challenging tasks and put forward some unrealistic research and development goals. However, successive failures and failures of expected goals have pushed the development of artificial intelligence to a low point.

The third is the application development period: from the early 1970s to the mid-1980s. Theexpert system that emerged in the 1970s simulates the knowledge and experience of human experts to solve problems in specific fields, realizing a major breakthrough in artificial intelligence from theoretical research to practical applications, from the discussion of general reasoning strategies to the use of expertise. The expert system has achieved success in the fields of medicine, chemistry, geology, etc., and has pushed artificial intelligence into a new climax of application development.

The fourth stage is a period of slow development: from the mid-1980s to the mid-1990s. With The continuous expansion of the application scale of artificial intelligence, the application field of expert systems is getting narrower and narrower, lack of common-sense knowledge, difficulty in acquiring knowledge, single reasoning method, insufficient distributed function and difficulty in compatibility with existing databases, these problems are gradually expose come out.

The fifth is a period of steady development: from the mid-1990s to 2010. Due to the development of network technology, especially Internet technology, it has accelerated the innovative research of artificial intelligence, and promoted the artificial intelligence technology to become more practical. In 1997, the International Business Machines Corporation (IBM) dark blue supercomputer beat the world chess champion Kasparov. In2008, IBM proposed the concept of "smart earth". The above are the landmark events of this period. The sixth is the period of vigorous development: from 2011 to the present. With the development of information technologies such as big data, cloud computing, the Internet and the Internet of Things, computing platforms such as perception data and graphics processors have promoted the rapid development of artificial intelligence technologies represented by deep neural networks. Crossed the "technical gap" between science and application. Artificial intelligence technologies such as image classification, voice recognition, knowledge question answering, human-machine games, and unmanned driving have achieved practical technological breakthroughs, and artificial intelligence has ushered in a new climax of explosive growth.

At present, artificial intelligence can be roughly divided into dedicated artificial intelligence and general artificial intelligence. At present, in the field of dedicated artificial intelligence, technology has made important breakthroughs. From the perspective of applicability, the latest advances in artificial intelligence are mainly concentrated in the field of dedicated intelligence (2). For example, in the Go game, AlphaGo beat the human champion; in the field of skin cancer diagnosis, artificial intelligence has reached the level of a professional doctor; artificial intelligence programs have reached a level beyond humans in large-scale image recognition and face recognition. Artificial intelligence can be roughly divided into dedicated artificial intelligence and general artificial intelligence. At present, dedicated artificial intelligence has made important breakthroughs. From the perspective of applicability, the recent progress of artificial intelligence is mainly concentrated in the field of dedicated intelligence. For example, AlphaGo defeated the human champion in the Go competition, the artificial intelligence program has surpassed the human level in large-scale image recognition and face recognition, andthe artificial intelligence system has diagnosed skin cancer to the level of a professional doctor.

But general artificial intelligence is still in its infancy, and the overall development level of artificial intelligence is still in its infancy. The current artificial intelligence systems have made significant progress in "shallow intelligence" such as information perception and machine learning, but their capabilities in "deep intelligence" such as conceptual abstraction and inference decision-making are still weak, with obvious limitations, which still can't replace human wisdom. Today, the field of artificial intelligence is at the forefront of innovation and entrepreneurship. The McKinsey company report pointed out that in 2016, the global artificial intelligence R&Dinvestment exceeded 30 billion US dollars and is in a stage of rapid growth; the world-renowned venture capital research agency CB Insights report shows that in 2017, 1,100 new artificial intelligence startups were established globally, and a total of the investment was 15.2 billion US dollars, an increase of 141% year-on-year. The social impact of artificial intelligence is becoming increasingly prominent, and it has its presence in various fields. As the core force of a new round of scientific and technological revolution and industrial transformation, artificial intelligence is promoting the upgrading of traditional industries, driving the rapid development of "unmanned economy". It has a positive impact on people's livelihood fields such as smart transportation, smart home and smart medical care.

Combined with the analysis of the current situation, the application of artificial intelligence in the field of animation is still in its infancy, and there is still much room for development. This article will introduce the actual application of artificial intelligence in the field of animation production.

3. Possibility of applying artificial intelligence in animation

3.1 Two-dimensional animation

3.1.1. Animation inbetweening frame generating

In animation draw, it is divided into original painting, key frame and in betweening frame. The inbetweening frame makes the movement look fluency and more natural and drawing the inbetweening frame is one of the most time-consuming and laborious parts of the 2Danimationproduction process. Drawing requires a lot of repeated labor to achieve. So in this step, using artificial intelligence to automatically generate intermediate frames in each key frame can greatly save the workload and production costs.

CACANi is a software developed by Singapore company for production two-dimensional animation, which can automatically generate vectorized in betweening frames. Given any two or more key frames, CACANi can automatically generate inbetweening frames. These intermediate frames are expressed in vectors, and there is no limit in number and precision. It frees the animators from the heavy in betweening frame making process, so that they can devote more energy to more creative creation. However, because artificial intelligence technology is still in its infancy, in some cases, the animator still needs to manually adjust the smoothness of the action. The software is also suitable for study animation students in school, because it avoids the tedious process of adding in betweening frames of animation. After the animation is completed, it can be replay immediately to see the effect, which is extremely helpful for learning animation.

3.1.2.Automatic coloring

Compared with the coloring standard of illustrations, animation coloring is simpler and more regular. Artificial intelligence can train AI algorithms for animation

coloring methods. According to the input style picture, refer to the color gamut of the picture. I can automatically color the line draft through the color reference picture and algorithm uploaded by the user.
The software Style2 Paints, jointly developed by the researchers of Suzhou University and theChinese University of Hong Kong, China, can be based on unsupervised deep learning, through style transfer and GAN technology, to transform the original line drawing into a full color drawing. The whole process is divided into two stages. In the first stage, the sketches rendered as a cursory color picture. In order to improve the picture, the second stage will
identify its errors and refine it to obtain the final result. And it is also very simple to use, as long as the artist completes the line draft, and then clicks with the mouse, you can get a full color sketch. For demanding animator, a little fine-tuning may be required. Through it, the producer can quickly complete the complex coloring process.

3.1.3. Scene generation
Many animations pursue a realistic background effect. The usual method is to draw it with reference to a real photo and complete it with fictional colors. But the algorithm using artificial intelligence can directly change the real photo into a cartoon-style background, and then apply it in animation production. Scientists at Disney and Rutgers University have published a paper introducing an AI model that uses text description to generate animated scenes. To allow AI to generate text to video, it needs to understand the text and then generate the corresponding animation. To this end they used a neural network of multiple module components. The model contains three parts. One is the script parsing module, which can automatically parse the scenes in the script, and then the natural language processing module, which can extract the main description sentences and refine them into action representations. Finally, there is a generation module, which can convert action instructions into animation sequences. The researchers collected thousands of scripts, selected 996 of them, and wrote a scene description corpus. Although the system still relies on a corpus, it is not yet possible to complete 100% text-to-video generation, but it brings a new direction to animation production.

3.1.4.Action generation
Adobe's new AE feature, which can automatically track human action and apply it to animation. This feature utilizes Adobe's artificial intelligence platform Sensei, which has been trained with more than 10,000 images to identify key points of the human body. The body tracker detects human movement in the source video, generates tracking points for the 18joint points of the arms, torso, and legs, and then transfers the tracking points to the character being animated. Similar to how Adobe's Character Animator can track facial expressions, this feature can quickly create 2D character animations. This function can also create a masking around the body to achieve a variety of effects, such as video color grading and highlighting the foreground. It can also be used to easily create an outline around the theme, the creator can delete this theme and fill the content, it will automatically fill based on the surrounding environment. This function can also be used to add dynamic graphics or other objects to the tracked human body — for example, if you want to animate a scene where a character is playing basketball, then you can keep the basketball tracking in the character's hands. To put it simply, just shoot a live-action video and the character's actions can be transferred directly to the animated character.

3.2. Three-dimensional animation

3.2.1 Generate character
In 3D animation production, for passerby characters with low accuracy requirements, artificial intelligence can be used to generate modeling and automatically generate different actions. The traditional modeling and trajectory making steps are omitted. Easily complete the action setting of passers-by. Greatly improve production efficiency.

3.2.2 Generate action
DANIEL HOLDEN and others at the University of Edinburgh, in their paper "Phase FunctionNeural Networks for Character Control" proposed a real-time role control mechanism using completely new network structure, named Phase-Functioned Neural Networks(PFNN). ThePFNN system can capture motion data together with scene terrain data by studying human motion and motion laws in large quantities. When characters encounter different 3Dsceneenvironments, they can quickly make the correct response required by the scene and make the character movement more natural and smooth. Almost like a real person.
There are three stages of data processing by PFNN:
(Pre-treatment stage)

a. Motion capture and processing to make the terrain data correspond to the captured motion data;
b. Phase extraction;
c. Adapt to the terrain. (Training and run phase)
d. PFNN learns from large, high-dimensional data sets. Determine the character action generated by each frame through the control parameters
e. According to the different phases, the system inputs the user's control, the character's previous motion state, the scene's geometric structure, and automatically generates high-quality motion to achieve realistic character motion.

4. The future development trend of animation

Future animations will focus more on entertainment, experience, participation, and interactivity, and animation production technology will be more capable of inspiring creators and liberating them from heavy production work. Intelligent production technology allows creators to pay attention to the creativity of the work. Animation

production can no longer be created only by professionals. Future animation production technology will be open to the public. As long as there is creativity, everyone can make their own animation works. With the continuous progress of science and technology, simplicity, ease of operation and intelligence, immersion will definitely become the development trend of animation production technology.

5. Conclusion

Animation production technology is closely related to the development of science and technology. In the intelligent era, various emerging technologies have been successfully applied in animation, which has brought revolutionary changes to the creation and production of animation. Animation production technology will be upgraded with the continuous development of science and technology. The advancement of AI technology will greatly reduce labor costs and improve the efficiency of animation production. The application of artificial intelligence will bring great convenience in the creation process of 2Dand 3Danimation. Increased productivity means more excellent works will emerge. But this will inevitably replace most of the labor force and cause portion animators to lose their jobs. But again, if AI technology is popularized and production costs are reduced, everyone can be an
animation director. At that time, there may be a large number of works produced, among which excellent works will be born be sure and animation creation may usher in a climax. It is undeniable that artificial intelligence will bring more technological innovation to the animation industry. We have reason to believe that the application of artificial intelligence in the field of animation has unlimited possibilities in the future.

With the improvement of animation technology, the focus of animation production is no longer on the technical level, which also provides new ideas for relevant education workers to train animation talents. Cultivate the ability of animation talents to work together with artificial intelligence, change the identity of animator from producer to creator, focus on the cultivation of students' creative thinking, instead of being confined to production and technology. Hand the low-end repetitive work to the machine pay more attention to thedevelopment of its own diversified artistic accomplishment and the creation of self-styleworks, I believe that more creative animation works with creativity and diversity will be born in the future.

Notes:

(1) Tan Tieniu. The history, present situation and future of artificial intelligence [J]. Smart China, 2019 (Z1): 87-91.
(2) Tan Tieniu. The history, present situation and future of artificial intelligence [J]. Smart China, 2019 (Z1): 87-91.

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Resumen: Hoy en día, la industria de la producción de animación se enfrenta a una presión sin precedentes, y la producción de animación va en aumento. Sin embargo, los principales talentos de la industria no han tenido un seguimiento suficiente, lo que ha hecho que los trabajadores de la producción de animación sean incapaces de asumir un gran número de tareas de producción. Hay que resolver cómo equilibrar la productividad de la animación y la calidad de la producción sin reducirla. El desarrollo gradual de la tecnología de inteligencia artificial en los últimos años ha traído una nueva forma de resolver los problemas de la industria de la animación. En este artículo se analizan las posibilidades que ofrece la aplicación de la inteligencia artificial en el campo de la producción de animación, se discuten los métodos de participación de la inteligencia artificial en la producción desde dos puntos de vista, el de la producción de animación bidimensional y el de la producción de animación tridimensional, y se ofrecen más ideas y métodos de trabajo para los animadores. Esta investigación pretende explorar nuevos caminos en las disciplinas del diseño, que afectarán a la enseñanza del mismo. En el futuro, los educadores podrán centrarse en el desarrollo de la creatividad de los estudiantes y encontrar formas más creativas y diversas de expresar la animación.

Palabras clave: Inteligencia artificial - Generación de animación - Producción de animación - Generación automática.

Resumo: Hoje, a indústria de produção de animação enfrenta uma pressão sem precedentes, e a produção de animação está aumentando. No entanto, os principais talentos da indústria não têm sido acompanhados o suficiente, o que tornou os trabalhadores da produção de animação incapazes de realizar um grande número de tarefas de produção. Como equilibrar produtividade de animação e qualidade de produção sem reduzir a produção precisa ser resolvido. O desenvolvimento gradual da tecnologia de inteligência artificial nos últimos anos trouxe uma nova forma de resolver problemas para a indústria de animação. Este artigo analisará as possibilidades trazidas pela aplicação da inteligência artificial no campo da produção de

animação, discutirá os métodos de participação da inteligência artificial na produção a partir de dois aspectos: produção de animação bidimensional e produção de animação tridimensional, e fornecerá mais idéias e métodos de trabalho para os animadores. Esta pesquisa visa explorar novos caminhos nas disciplinas de design, o que afetará a educação em design. No futuro, os educadores podem se concentrar no desenvolvimento da criatividade dos estudantes e encontrar formas mais criativas e diversificadas de expressar animação.

Palavras chave: Inteligência artificial - Geração de animação - Produção de animação - Geração automática.

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Realidad Virtual como elemento inmersivo para la educación

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Resumen: La transformación que vive la comunicación actualmente ha llegado a un punto tal en donde el usuario está cada día más inmerso en la cultura, arte, publicidad, narrativa y la educación no se escapa de este fenómeno, por lo que resulta urgente (re)inventarse para poder tener un rol protagónico en la formación de las personas, es por esta razón que el aprendizaje inmersivo se va implementado cada vez más en espacios educativos. Este artículo analiza cómo la Realidad Virtual puede ser un elemento o técnica de inmersión de mediación pedagógica en los procesos de enseñanza.

Palabras claves: Aprendizaje inmersivo - Realidad Virtual, - educomunicación - educación.

[Resúmenes en inglés y portugués y currículum en p. 197]

Para iniciar este artículo retomamos un tuit publicado por Carlos A. Scolari que planteaba lo siguiente: "Si me preguntan "¿Qué viene después de transmedia?" aquí la respuesta: inmersión"; (Scolari, 2019). Es decir, la transformación que vive la comunicación actualmente ha llegado a un punto tal en donde el usuario está cada día más inmerso en la cultura, arte, publicidad, narrativa y la educación no se escapa de este fenómeno, por lo que resulta urgente (re)inventarse para poder tener un rol protagónico en la formación de las personas.

Antes de sumergirnos en analizar la Realidad Virtual como un elemento o técnica de inmersión que puede construir a los procesos de enseñanza debemos retroceder un poco para conocer el surgimiento de los nuevos medios en los tiempos de la convergencia mediática y su implicación en la industrias culturales; N. Postman (1998) decía: "un nuevo medio no agrega algo; lo cambia todo". Es decir que el nacimiento de un nuevo medio no desplaza o destruye otro, sino que lo dinamiza se transforma. La aparición de un medio modifica la situación existente; un ejemplo de esto es lo que ocurre actualmente: no solo las personas se relacionan a través de los medios, sino que interactúan con medios que están comunicándose entre sí.

En este nuevo panorama, L. Manovich (2005) plantea que los nuevos medios "son medios analalógicos convertidos a una representación digital", desde esta perspectiva podemos deducir que la Realidad Virtual es una pantalla donde la simulación representa lo digital. El concepto de Realidad Virtual nace en los años 80 con Jaron Lainer; actualmente es un concepto vigente:

> Estamos hablando de una tecnología que utiliza vestimentas computerizadas para sintetizar realidades compartidas...vestimenta que debes ponerte para percibir un mundo distinto al mundo físico.... se crea la ilusión de que mientras te estás moviendo el mundo virtual resta inmóvil. (Lainer, 1989).

Esto supone lo que algunos teóricos han llamado el triángulo de la Realidad Virtual compuesta por imaginación, interacción e immersión.

Estas tres características son las que diferencian la Realidad Virtual de los entornos tradicionales de 3D.