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Computer-Aided Design AND APPLICATIONS

Automatic Generation and Design of 3D Animation Based on Deep Learning Technology

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Abstract. With the rapid development of information technology and modernization, 3D animation automatic generation design has new opportunities and challenges with the help of high-tech. Based on CAD and deep learning technology, this paper studies the process of 3D animation automatic generation and design. Firstly, the development status of CAD and deep learning technology is described. The CAD model is used to deal with the detail level in 3D animation, and the initial parameter model is integrated with the CAD geometric modelling. Through feature-matching error control, the automatic generation system is constructed. A deep learning algorithm was used to recognize and generate a 3D animation character's posture and facial expression. Finally, based on the deep learning algorithm, the data training and learning system is built to improve the 3D animation generation effect and speed. The results show that the automatic 3D animation generation system based on CAD and deep learning technology can complete many functions, such as automatic parameter adjustment and character generation and recognition. In the scene construction and animation, effect rendering has a good effect.

Keywords: CAD Technology; Deep Learning Algorithm; 3D Animation; Automatic Generation; Animation Scene
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1 INTRODUCTION

In the 1990s, a new form of animation came out, and 3D animation has become the most attractive and potential media type since its birth. In recent years, with the help of information technology and intelligent technology, 3D animation has achieved good development not only in creative generation but also in design innovation [1]. 3D animation developed from traditional 2D animation, but its theoretical research is relatively lagging behind; digital technology reflects the aesthetic trend of 3D animation. The interaction of inheritance and innovation together constitute the unique aesthetic of 3D animation. In essence, 3D animation is an artistic expression of real life. The value of this

expression is not only reflected in the animation itself but also in People's Daily spiritual needs. As can be seen from the above definition, 3D animation, as an art form to express social life, uses intelligent language such as symbols to complete the cross-border integration of multiple disciplines [2]. The automatic generation of 3D animation not only requires the smoothness and realism of the animation but also requires efficient automation processes to reduce manual intervention and costs. Here are some extended descriptions of how to combine intelligent algorithms with automatic generation of 3D animation: Intelligent path planning: In 3D animation, the character's movement path is crucial for creating realistic and natural animations. By using intelligent algorithms such as the A * algorithm, Fast Random Tree (RRT), or Probability Roadmap (PRM), the optimal path from the starting point to the endpoint can be automatically generated [3]. Traditional 3D facial animation is usually synthesized by animation artists manually modelling keyframes or using facial capture techniques. The former requires a lot of time and effort, while the latter requires expensive capture equipment. The research work mainly focuses on generating three-dimensional facial animations with lip sync, controllable posture, and natural facial expressions from the perspectives of speech and video. Firstly, in order to compensate for the scarcity of 4D data, improve robustness to noise and outliers, as well as generalization across languages, a self-supervised pre-training model wav2vec2.0 is used to extract speech features [4]. Finally, an encoder-decoder network was designed and constructed using time convolution and grid convolution to fit the complex mapping relationship between speech features and 3D facial models. Firstly, fix the voice-driven network and use its output 3D facial lip animation as the basis, while extracting the speech features output by the encoder. Grid convolution has a locally invariant filter that significantly reduces the number of parameters in the network through grid surface sharing. Next, in response to the linear layer regression of 3D face offset points used in the current method, grid convolution is introduced to better learn the geometric structure of the 3D face model. The research on speech-driven 3D facial animation generation mainly focuses on lip synchronization, using speech information as input and training on the 4D facial audiovisual dataset VOCASET [5]. Therefore, considering other input methods, such as voice and video, can be an indispensable supplement to inferring facial movements, making it of great research significance for computers to automatically generate corresponding facial animations. Mainly focusing on posture control and natural facial expressions, an additional expression and posture network is built on the basis of voice-driven methods, and experiments are conducted on publicly available two-dimensional facial audiovisual datasets. The objective and subjective evaluation experiments have shown that the proposed audio-video joint-driven 3D facial animation generation method achieves the best results compared to other models. Animation style transfer: By combining intelligent algorithms with style transfer technology, automatic conversion of animation styles can be achieved. For example, one animation style (such as cartoon, realistic, etc.) can be automatically converted to another style without the need for a lot of manual work. This can not only improve the efficiency of animation production but also bring a more diverse visual experience to the audience [6].

Animation, as a fashion term, is an inseparable subject in art. Cartoon animation, animated movies, online games, multimedia and other products have been deeply integrated with the animation industry. 3D animation and other related industries are supported by computer digital technology, covering many fields, and the economic income it brings far exceeds the designer's expectations. Developed countries such as the United States and Japan have long occupied the 3D animation market, and entertainment and technology have become the main contents affecting national economy and culture. More and more spatial visuals give the experience a feeling of being there [7]. In the diversified development of 3D animation, special generation methods and design styles have become the main content that affects the audience of 3D animation. Through the analysis of the technical level of 3D animation generation, it can be seen that 3D animation design involves both aesthetic level and technical processing levels. The change in visual culture in modern society has become the main factor affecting the generation and design of 3D animation. People begin to pursue 3D animation works that are more intelligent and more in line with intelligent life. 3D animation has become an important medium for disseminating culture in modern life. The perfect combination of digital technology and art also means that people's pursuit of scientific and technological materials is more demanding. Various special effects and characters in 3D animation

constantly challenge traditional art styles. As a media type with a high amount of technology, the development of animation is closely connected with intelligent technology. On the one hand, the production efficiency of animation can be improved through intelligent technology creation. However, the traditional 2D animation production process still stays in the design and drawing of the original animation, which greatly restricts the development of animation. On the other hand, 3D animation creation reflects the technological progress of The Times. It provides a broader space for animation works, and producers are no longer limited by technical limitations and can transform imagination into creativity to show the audience. The 3D animation effect is more vivid and the plot is realistic. Behind this special visual image, a complex data framework and technical support are needed. The special visual Angle of 3D animation is essentially an extension and change of the aesthetic field. The role of vision in traditional media has been weakened, but the emergence of 3D animation makes vision a direct factor affecting audience experience. To sum up, the generation and design of 3D animation cannot be separated from the help of high-tech. With the support of CAD and deep learning technology, this paper studies and innovates the application of 3D animation automatic generation and design process.

2 3D ANIMATION AND THE DEVELOPMENT OF CAD AND DEEP LEARNING TECHNOLOGY

In the process of automatic generation of 3D animation, CAD modelling technology plays a crucial role. The automatic generation of intelligent agent character animation is essentially the simulation of living organisms with autonomous intelligent behaviour and has important application prospects in fields such as film and television special effects production, non-player character control in games, virtual reality, simulation testing, etc. [8]. A solution and prototype system for the automatic generation of intelligent agent character animations. The integration of the above key technologies has formed the final solution, and a prototype system for the automatic generation of intelligent agent character animation has been preliminarily implemented [9]. Wang and Shi [10] designed and developed a life simulation tool for autonomous intelligent behaviour to meet the requirements of intelligent algorithm simulation testing in unmanned driving missions. Introducing intelligent agents to model the behaviour of characters, treating them as independent actors who can perceive simulation environment information, plan paths, and then make behaviour control decisions—external presentation of intelligent agent behaviour (character animation). We have designed and implemented solutions for the automatic generation of character animations based on deep learning for bipedal and quadruped intelligent agent characters and and focused on the research of automatic character animation methods for bipedal (human) and quadruped (livestock) intelligent agents. The internal behaviour patterns and decision simulation of intelligent agents (behaviour modelling). Wang et al. [11] improved the autonomy and intelligence of character animation by modelling the agent-based behaviour of characters. It not only requires simulation modelling of the internal behaviour patterns and decisions of the intelligent agent (behaviour modelling) but also requires a realistic presentation of the external behaviour of the intelligent agent (character animation) so that the intelligent agent can interact autonomously and realistically with the external environment. Enable the two characters to make coherent, realistic, and diverse actions in real time based on the terrain. The system tested and validated the proposed solution by implementing multiple representative character animation scenes.

In recent years, with the improvement of people's living standards and the popularity of the Internet, the demand for cultural products has become increasingly strong, bringing about changes in the animation industry. Xu [12] analyzed a new collaborative management system that fits the animation production process to meet the needs of industrial development. From the initial D animation to the current popular animation, not only has it brought about an upgrade in animation effects, but it has also correspondingly increased development costs. Especially with the increasing demand for 3D animation products, the industrialization of the 3D animation industry has not kept up with the development of technology, making the production of 3D animation products increasingly difficult. The current forms of enterprise data storage are diverse, and selecting appropriate storage through reasonable analysis of one's own business can lay a solid foundation for the development of

the enterprise. In order to achieve anytime, anywhere access and reading of data, and save local storage costs, Xu and Xu [13] chose appropriate cloud storage services without considering maintenance issues such as data backup. In the process of 3D animation production, a lot of business data and media resource files will be generated. Data is the lifeline of enterprise development, and reasonable and effective control of data is the cornerstone of enterprise development. The emergence of a large amount of structured and semi-structured data has made information storage a bottleneck in the development of the 3D animation industry. In addition to the confusion of data, the chaotic allocation of personnel in the production process of animation products is also constraining the speed of the industry. The relationship between personnel and tasks is weak, and system managers find it difficult to grasp information such as project progress and personnel allocation. Developers have a one-sided understanding of their current tasks, past tasks, and pending tasks. The development of this platform is aimed at facilitating the development of enterprise projects. In addition to issues with data and file storage, there are still issues such as unclear personnel division and unclear project progress in the process of creating 3D animation media resources. Zhang and Chen [14] chose the FastDFS distributed file storage system to store the media resource files generated by Zhang during the 3D animation production process, based on the problems encountered during the process. By using relational MySQL to store business data and non-relational database MongoDB to store file storage information, the problem of huge storage volume and query speed is solved. FastDFS, as a distributed file storage system, can meet the needs and be encapsulated on this basis to allow external access through APIs, achieving cloud storage.

In addition, based on VAR (Visual Activity Recognition) technology, we can further analyze these pose sequences, understand the actions and behaviours they express, and adjust and optimize them as needed. For example, when creating a scene where a virtual character engages in dialogue, we can first use 3D assets to synthesize the character's basic poses and actions. By combining these two, we can achieve more advanced automatic generation of 3D animations. Once the model training is completed, it can capture the user's facial expressions in real time and map them to the 3D character model, achieving a dynamic generation of facial expressions. In addition, we can further explore the application of reinforcement learning and other technologies in the automatic generation of 3D animation, in order to achieve more intelligent and autonomous animation generation. Then, deep learning models are used to capture the user's facial expressions and dynamically apply them to the character model. Through this method, Zhao and Zhao [15] generate 3D animations that combine rich body movements with vivid facial expressions, greatly enhancing the user experience and realism of the animation. For example, by allowing virtual characters to self-learn and explore in a virtual environment, we can enable them to automatically learn how to walk, jump, interact, etc., resulting in more natural and realistic animation effects.

3 RESEARCH ON AUTOMATIC GENERATION AND DESIGN OF 3D ANIMATION BASED ON CAD AND DEEP LEARNING TECHNOLOGY

3.1 Research on Automatic Generation of 3D Animation Detail and Simulation Based on CAD Technology

3D animation, also known as 3D animation, is a new form developed with the development of computer technology. 3D animation software creates a virtual world in the computer, and designers express their imagination through the virtual space. The size and shape were established according to the design idea. Using this 3D scene, the motion trajectory and other parameters of the corresponding model are set. When all this is completed, the computer can be automatically run to complete the purpose of automatically generating the picture. The beginning of 1995 was the initial development period of 3D animation, and the first 3D animated film was born in the United States. Until the 20th century, the development of computer network technology made 3D animation no longer limited to movies and media videos, and various games and interactive scenes supported by 3D animation became a common phenomenon in modern life. As the world's second-largest producer of animated games, Japan adopted animation as its second pillar industry as early as 1996. They also

used 3D animation in the construction of game scenes to enhance the authenticity of the game experience. China's digital media started late, and the market demand is large. Professional studies in 3D animation have also begun to be established in various universities. With the development of the 3D animation industry becoming more and more mature, many researchers began to pursue the automatic generation and innovative design of 3D animation.

From drawing to 3D manufacturing, CAD technology has been involved in many fields and industries and has become an indispensable auxiliary tool. CAD technology was developed in the 1950s, and American researchers proposed CAD assistant systems to help geometric models analyze. At this time, graphic modification and parameter setting could be completed on the screen. Subsequently, CAD technology was gradually applied to two-dimensional drawing and three-dimensional scene construction. It can reorganize two-dimensional interactive pictures in three-dimensional space and use three-dimensional surface models and solid models to display and generate any geometric modeling. Modern CAD technology can support the automatic design of products in a complex system environment, and it is also the general term of auxiliary tools and design models, which can make the design work realize network and intelligence, shorten the design cycle, and improve the design quality. Deep learning is a branch of the field of machine learning that uses artificial neural networks as the framework for data representation processing. Deep learning algorithm has good applicability in sample learning and intrinsic law finding and has been widely used in visual communication, speech recognition, image processing, and other fields. Through the layer-by-layer transformation of the original signal, the input and output results are iterated continuously, and then the sample data layer is transformed into a new feature space so as to obtain the output result after automatic learning. This fast hierarchical processing model is conducive to the construction of various visual models. Deep learning algorithm breaks the limitations of traditional neural network training structures. Some scholars have applied it in robot training, using program capture to complete the iterative optimization of execution commands. In the relevant research results, it can be seen that robots can eventually achieve hand-eye coordination, and all behaviours are obtained from learning training, rather than relying on traditional program systems, subvert the previous algorithms. With the gradual deepening of modern life, the characteristics of freshness and authenticity of 3D animation are becoming more and more obvious, mainly reflected in visual enhancement and atmosphere rendering. This amazing sense made the masses feel like they were there. 3D animation can provide creators with rich imagination space, which can be said to be another media revolution in history.

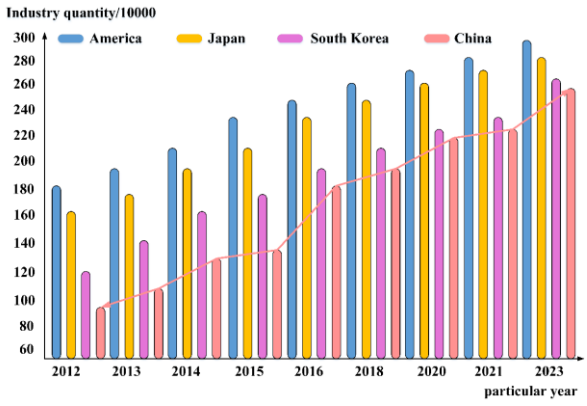

Figure 1: The development trends of the animation industry in various countries.

According to the data, the largest animation industry in the country comes from the United States, and they can achieve output revenue of more than $5 billion per year through animation products and

derivatives. Japan has added animation to movies, cartoon games, and electronic products, becoming the world's largest producer of animation. In third place is South Korea, which is also very strong. We make statistics on the development trend of the animation industry in various countries, as shown in Figure 1.

As can be seen from Figure 1, with the gradual increase in the development of the animation industry over the years, except for the United States, which ranks first, Chinese animation started late and now ranks last. At the same time, according to the survey, Chinese youth respected Japanese animation around 2000, but with the development of China's animation industry, domestic animation gradually gained popularity in the later period. Animation generation and manufacturing need to rely on computer-aided technology. From computer hardware and software categories to detailed operating systems and media processors, all have their own influence on 3D animation effects. We have summarized and sorted out 3D software, as shown in Table 1.

Software Category	*Market Positioning*	*Production Type*	*Flexibility*	*Material Quality*
3D MAX	Industrial Design.Multi-Media. Space Design	3D	Good	Good
Rhinoceros	Industrial Design. Modelling Design	Both Are Acceptable	Good	Differ From
Autocad Viz	Space Design	3D	Same As	Good
Autocad	Industrial Design. Space Design	Both Are Acceptable	Differ From	Differ From
Maya	Multi-Media	3D	Good	Good
Softimage XSI	Multi-Media	3D	Good	Good

Table 1: Summarize And Organize Various 3D Software.

It can be seen from Table 1 that most of the software can complete industrial design and media design according to the division of the software in terms of market positioning. Product production types are also divided into 2D plane and 3D space two, according to the use of flexibility to judge the application of different software fields. In this paper, CAD technology is used to study the automatic generation of 3D animation. The starting point of CAD technology is to improve the adjustment of data parameters as a medium to change the design product from the perspective of traditional drawing. Since there are many details involved in the animation generation process, the CAD layering function is used to increase the accuracy of detail processing by parametric calculation. In animation picture generation, the method of multi-lateral modelling is used to describe the three-dimensional object. All surfaces are represented in linear equation form, which is easy to simplify and speed up drawing. This also satisfies the work efficiency of the 3D animation generation system, and the animated graphics seen on the screen can be composed of points, surfaces, and lines. Each face has a different size and orientation and is arranged with points and line segments to form a complex three-dimensional pattern. The level of detail determines the resolution and precision of 3D animation. CAD software is used to reduce the complex data set of 3D animation models, so that 3D animation is simple to complex, from rough to fine. The processing modules of different levels are set

up, and the data sequence number is constructed for any given complex network. The distance between each adjacent network can be expressed by the following formula:

$$M_1, M_2, MiM_0 + 1(IE / mn) \tag{1}$$

Combined with topological geometry, the flat effect of 3D animation is maintained, which limits complex algorithms to a certain extent. We represent the structure of the 3D animation automatic generation system designed by CAD modelling, as shown in Figure 2:

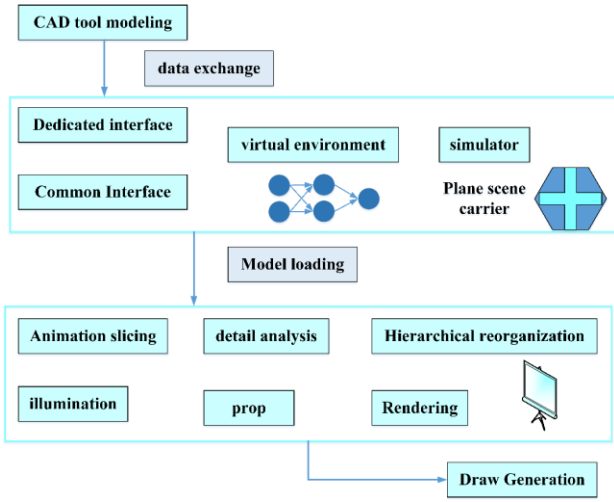

Figure 2: A 3D animation automatic generation system for CAD modelling and design.

As can be seen from Figure 2, the data required for 3D automation is first interactively processed, and the data conversion is completed by the interaction process of the special interface and the general interface. The model is loaded into the three-dimensional scene to construct one-sided discrete animation information. With lighting, colour rendering, atmosphere rendering and other modules, display output. The advantage of CAD technology parametric modelling is used to represent the rule features in the automatic generation system, and the quick modification of the animation is completed through the change of parameters. In parametric modelling, the dependency relationship between the features is established, and the animation generation path is judged according to the correlation of the dependency relationship to ensure the global reliability of the generated model. The geometric elements in the animation can be operated directly, without considering the effectiveness of the features, and without being restricted by the ordering of the elements, which improves the flexibility of the 3D animation automatic generation system. Any motion in 3D animation cannot leave the trajectory, so it is necessary to determine the trajectory in the automatic generation and design of animation. Each object is stored in the computer in the form of three-dimensional data, and the motion trajectory of the animation is also determined within the CAD system. The geometric elements within each constraint are linked together in the system, and the geometric elements are expressed mathematically, the formula is as follows:

$$l_{al} - M_1 l_{b1} = D_1 \tag{2}$$

$$\sum_{j=0}^{m} \sum_{k=0}^{n} M_i e_i k - M_j \bullet e_{jk} \tag{3}$$

In the formula, M_i Represents screen elements. This graphical constraint solution is the final result of the animation data distribution. Each constraint contains different shapes, and the number of shapes is expressed as:

$$u = [o + (x)^2 \,/\, mr + y_2] \tag{4}$$

Among them, u Represents the number of forms. The 3D system also needs to satisfy the all-round rotation of the image in the automatic generation of animation. That is, after generating the design, playback or display a certain frame as required to achieve the dynamic effect of the animation. The transformation formula of the three-dimensional coordinate rotation principle is as follows:

$$[x, y, z] = [x, y, z] \begin{bmatrix} 1, \cos, 0, \sin \\ 0, \cos, \sin, 0 \\ 0, -\sin, 0, -\cos \\ 0, 0, 0, 1 \end{bmatrix} \tag{5}$$

$$[y, x, z] = [y, x, z] \begin{bmatrix} 0, -\sin, 1, \tan \\ 0, \tan, \cos, 0 \\ 1, \sin, 1, \cos \\ 0, 0, 0, 1 \end{bmatrix} \tag{6}$$

$$[z, x, y] = [z, x, y] \begin{bmatrix} 1, -\cos, 1, \mathrm{t}- \mathrm{an} \\ 1, \sin, \cos, 0 \\ 0, \tan, 1, \cos \\ 1, 0, 0, 1 \end{bmatrix} \tag{7}$$

The above formulas represent sets of rotations in different directions. The automatic 3D animation generation system using CAD technology can not only simulate the motion trajectory of animation but also adjust the data at any time to make the animation effect more realistic. Subsequently, with the support of deep learning algorithms, we also conducted research on the recognition of relevant character elements, pose changes and face design generation in 3D animation.

3.2 Research on 3D Animation Character Design and Automatic Face Generation Based on Deep Learning Technology

3D animation automatic generation technology, with the help of deep learning algorithm to achieve the adjustment and design of animation content. We use a deep learning algorithm machine learning model to process the known data set features and calculation results in the generation process. The traditional 3D animation generation system lacks learning ability, a lot of dynamic data is wasted, and the animation quality also depends on the level of the designer. The 3D animation automatic generation and design system involved in this paper can use historical animation data as training samples so that machine learning can automatically generate animation products that meet the needs of the masses. Although the user's evaluation of the animation is a subjective judgment, it is still possible to infer the user's preference according to a large number of data calculations. In order to make the learning and training objectives clearer, we need to use more specific evaluation objects, and the animation scene is the most intuitive content. In the automatic generation system, the space and layout of the animation scene directly affect the addition of subsequent models. First, the deep learning algorithm was incorporated into the automatic animation generation system, and the optimized system process was built as shown in Figure 3.

As can be seen from Figure 3, the 3D generation system is divided into three modules: information extraction, animation scene planning, and animation quantitative calculation. The other auxiliary modules are environment rendering and file storage respectively. The 3D animation automatic generation system relies on the dynamic material library, which contains elements, scenes, characters, music and other content. Among them, the recognition and posture judgment of characters are more difficult, and we focus on this direction in the research. The data training and learning process of the deep learning structure is shown in Figure 4.

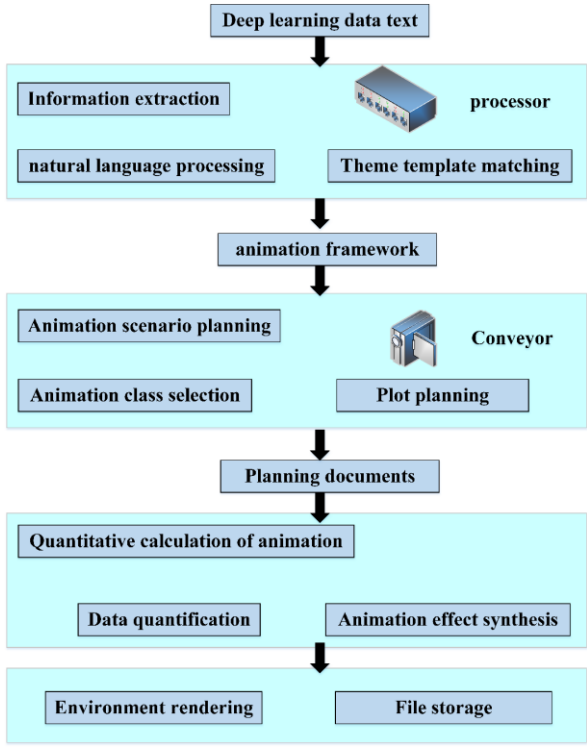

Figure 3: Optimized system process.

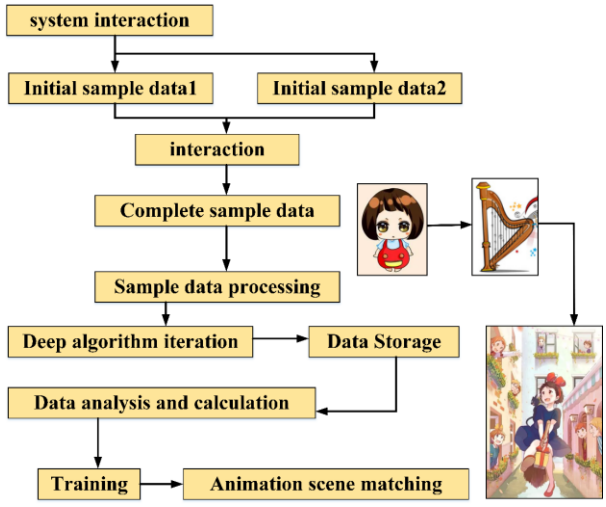

Figure 4: Data training and learning process of deep learning structures.

As can be seen from Figure 4, the system interacts to generate the initial sample, extracts the complete sample information from the three-body animation generation system after the animation scene is conveyed, and then adds the sample information to the management analysis module to achieve data storage and transformation. The transformation of 3D scenes is realized through element collocation, and then the generated 3D animation scenes are trained and optimized from the

training module, so as to improve the performance of the 3D animation automatic generation system. Among them, the character posture can be positioned by the feature size of the pixel value, and the feature vector formula is as follows:

$$wh = x_1 + y_0(ur) / h_m \tag{8}$$

After the input of 3D images, the contrast network structure is used to set the deep learning effect. As the propagation times increase, the accuracy of gradient calculation will fluctuate accordingly, so we introduce an activation function to improve the above problems:

$$x_{1+1} = x_1 + F(x_1, w_1) \tag{9}$$

In the formula, x_1 An input variable represents a deep learning network. F Represents the activation function value. The automatic generation and design of 3D animation are prone to loss variables in gradient calculation. This loss calculation will affect the efficiency of system generation. We calculate the value of the loss function:

$$L = \sum_{j=0}^{h} \sum_{i=1}^{w} l_{i,j}((x-x)^2 + (y-y)^2) \tag{10}$$

At the same time, the coordinates of the face model in the 3D character are extracted, and the design effect of the 3D animation is improved by describing the shape and adjusting the parameters and expressions. The expression changes in the face model are defined as:

$$M(\beta, \alpha, \lambda) = W(T_p(\beta, \theta, \alpha), J(\beta)\omega) \tag{11}$$

The image mask is used to complete the mixed-weight processing and smooth optimization of the contour lines. The optimized face model is more realistic:

$$J(B, N, M) - (S) = J_r(T + B(S)^2) / \alpha + \beta \tag{12}$$

$$B_0(B, S) = \sum_{n=1}^{B} B_m S_n \tag{13}$$

The data in the 3D animation automatic generation system can be dynamically adjusted to complete the expression correction through the tracking path of the expression pose. According to different 3D animation scene characters and expression needs, they will change accordingly. However, the same template cannot be adapted to multiple scenarios. Therefore, we only define the initial formula in the study:

$$p_B(\theta, p) = \int R[o + \theta - R_n] \tag{14}$$

With the application of the initial formula template, it can complete the generation of animation characters and roles under the same parameter requirements. Finally, activation function and noise removal are used to improve the reliability of character data in the 3D animation automatic generation system:

$$E(x + y_0) = \sum_{i=j}^{n} WR_n \tag{15}$$

After the noise removal, the whole picture is more beautiful, and it also has a good characteristic performance in the authenticity judgment. Using the above formula, we can not only generate complex 3D animated characters but also capture changes in facial features. Due to the adjustment of parameters and the learning and training of the neural network, the 3D animation automatic generation design can also adjust the animation presentation works according to the audience's favourite.

4 RESEARCH RESULT ANALYSIS OF 3D ANIMATION AUTOMATIC GENERATION AND DESIGN BASED ON CAD AND DEEP LEARNING TECHNOLOGY

4.1 Research Result Analysis of 3D Animation Detail and Simulation Automatic Generation Based on CAD Technology

Generally, the entire generation and design process of a 3D animation scene needs to be composed of several steps. First of all, we should complete the preliminary design and preparation for the creative project to provide the general direction for the generation of 3D animation works, and then configure the appropriate animation characters and scene Settings. Change the 3D animation style through the choice of props, special effects, and colours. Finally, we should use the lens and time control to master the rhythm of the 3D animation scene. In this study, we use CAD technology to deal with the details in the automatic generation of 3D animation. A hierarchical template summary is used to simplify the work tasks generated in each scenario. Obtain the identification of all elements in the 3D animation model, locate each data topological information, and set the slice control parameters so that the details elements and the model are separated from the space, and only the feature information is retained. We compared the detail level of 3D animation effects before and after optimization with CAD technology, as shown in Figure 5:

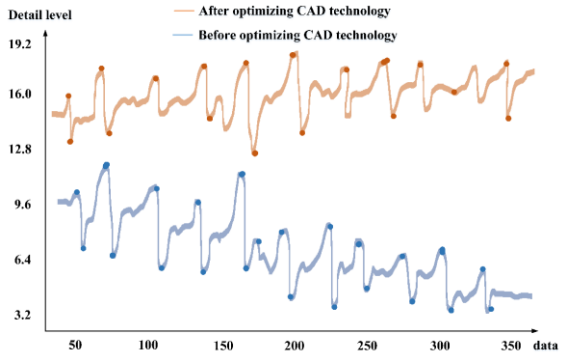

Figure 5: Comparison of the level of detail in 3D animation effects before and after optimization using CAD technology.

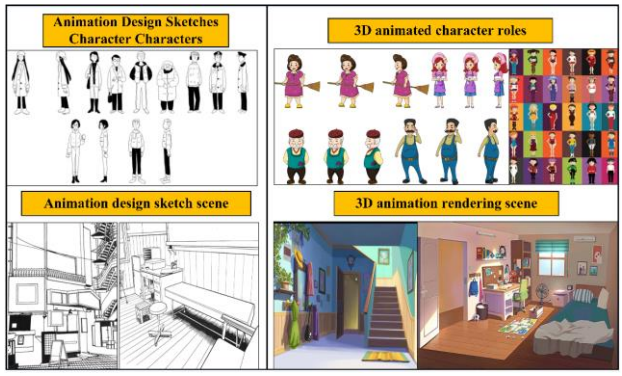

Figure 6: Comparison of two 3D animation effects.

As can be seen from Figure 5, the larger the parameter, the higher the fineness. The precision of the animation effect after CAD technology optimization is obviously higher than that before CAD technology optimization. This kind of simulation generation and design improves the viewing of 3D

animation from the changes in intuitive space. Compared with the traditional two-dimensional sketch animation design, the 3D effect is more realistic, as shown in Figure 6.

As can be seen from Figure 6, the two-dimensional plane on the left as the animation design sketch is relatively simple, whether it is scenes or characters, while the 3D animation scene generated on the right gives people visual impact from space, and the audience can more clearly obtain the visual information transmitted by 3D animation.

4.2 Research Result Analysis of 3D Animation Character Design and Automatic Face Generation Based on Deep Learning Technology

The automatic generation and design system used in this article selects real 3D animations as data information based on training data. Before extracting features, perform grayscale conversion on images with different attributes to unify image features. To further validate the effectiveness of the algorithm, we compared traditional 3D animation with automated generation systems optimized by deep learning techniques using an open questionnaire survey. The difference between the two can be reflected in the degree of realism in the generated animation works, as shown in Figure 7:

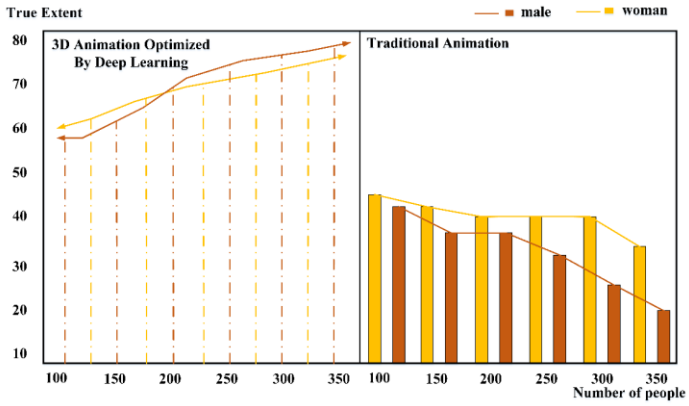

Figure 7: Comparison of the realism of 3D animated characters using two algorithms.

As can be seen from Figure 7, we divided the comparison group into two groups: male and female. According to the results of the questionnaire survey, most people believe that the facial expressions constructed by the automatic generation system optimized by deep learning technology are more realistic. The traditional animation generation effect and the authenticity feedback are relatively low. At the same time, there is also a part of the public feedback that in animation search, if you often watch a certain type of 3D animation works, it will affect the style change of the automatic generation system. It can be seen that the 3D animation automatic generation and design system trained by deep learning technology can adjust the direction of work generation according to the use of traces of the masses.

5 CONCLUSIONS

3D animation is a complex collection of images, which is not only influenced by digital technology but also by social, cultural and economic factors. At the same time, the development of 3D animation also depends on the progress of information technology, and digital technology and intelligent technology provide the necessary technical support for 3D animation generation. In this context, based on CAD and deep learning technology, this paper studies the 3D animation automatic generation and design model. Firstly, we investigate the development of CAD technology and deep learning technology and find that they have good applicability in 3D modelling, image processing and feature recognition. CAD

models are used to process details in animated scenes. 3D modelling is used to generate a detail processing framework, and accurate control and template of parameterized variables are used to complete the output of animation scenes. Secondly, the use of CAD technology to build animation simulation space can make designers more clearly understand the impact of different parameter changes on 3D animation scenes. The deep learning algorithm is used to mark the character pose features of animation generation works and identify and construct facial features. Finally, the learning experience model is used to improve the universality of the system. Make the 3D animation automatic generation and design system, in the service for users, to provide animation works that meet the needs of users. The results show that CAD and deep learning technology can improve the efficiency of 3D animation automatic generation and design systems, and have obvious reliability in practical application.

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