

"Hand-drawn +3D" Disney Animation Film Artistic Adherence and Technological Innovation

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Abstract: Throughout the long development of Disney's animated films for more than half a century, after experiencing the brilliance of the "hand-drawn animation era" and the downturn and hesitation of the "3D animation era", Disney opened up a new era of animated films with the new "3D+ hand-drawn" technology. Its breakthrough in production technology and the inheritance of animation art make it represent the highest level of today's animated films. This paper will try to explore the technical breakthrough and artistic inheritance of Disney's animated films through the brief tracing of Disney's animation production tradition, taking Frozen and Zootopia as examples.

Keywords: Hand-drawn Animation; 3D Technology; "Frozen"; Breakthrough.

1. Introduction

"Frozen" was the Walt Disney Animation Studio's 90th birthday celebration in 2013, and it quickly swept the world, surpassing "The Lion King" at the box office to become the highest-grossing film in Disney animation history. Three years later, 2016's "Zootopia" pushed 3D animation to the technical peak of the world's animated films. Looking at the long development road of Disney's animated films for more than half a century, after experiencing the brilliance of the hand-drawn animation era and the downturn and hesitation of the 3D era, Disney opened up a new era of animated films with the new "3D+ hand-drawn" technology. Its breakthrough in production technology and the inheritance of animation art make it represent the highest level of today's animation film.

2. Hand-drawn Animation -- From Golden Signs to Sluggish Hesitation

Traditional animation, also known as hand-drawn animation, mostly refers to celluloid animation, "celluloid films made of transparent cellulose acetate, full name celluloid, or cell. The animator first draws the animation on paper, and then through the light transmission of the copy station, the pattern is traced to the celluloid film, after coloring and juxtaposition with the background, and then shoots with the film camera one by one, which is a pure manual production method."

In 1989, the animated film "The Little Mermaid" was the first to scan the completed animation into the computer color, but "since the continuous action frames in the middle still need to be drawn by the animator one by one, it is still a hand-painted category". This traditional production technique was invented by American Al Hurd in 1915, which allows painters to not only save production time, but also allow artists to express ideas more freely. It is a milestone in hand-drawn animation technology. 1990s "The Little Mermaid", "Beauty and the Beast", "Aladdin" and "The Lion King" four animated films are the peak of Disney's hand-drawn animation works, its important artistic characteristics and breakthroughs (take "The Lion King" as an example) : first, role shaping, animators will not only the animal image and habits of exaggerated anthropomorphic, but also lose the nature of

animals; Second, the scene drawing, the picture of wildebeest galloping in the grassland is very slow, the picture is beautiful, which is a great innovation in the history of animation; Third, the music, the exotic song and dance with the western free and easy rock and roll mutual integration, the Disney song and dance animation model to the peak. Hand-drawing is the most typical traditional production method of Disney.

Even in the 1990s, the advent of 3D technology did not make Disney give up their hand-drawing production tradition. However, the audience gradually got tired of these unchanging features such as fairy tales and Broadway song and dance styles. With the success of Toy Story, 3D technology occupied almost the entire animation industry. Pixar and DreamWorks subverted Disney's animation production technology and narrative tradition, resulting in Disney's hand-drawn tradition being gradually forgotten in the animation film market. Since then, it has entered a long period of confusion. After giving up the hand-drawing tradition, it has thrown itself into the fierce competition of 3D computer image. However, there were few successful 3D animations produced by Disney in this downturn period, until the advent of Frozen in 2013, which opened up a new era of Disney's animated films with a brand new "3D+ hand-drawn" technology.

3. "Hand-drawn +3D" -- Technical Breakthrough and Artistic Inheritance of Disney's Animated Films

3D animation, also known as 3D animation, is produced with the development of computers. 3D animation software first establishes a virtual world in the computer, and then builds a model according to the shape and size of the object in the virtual 3D world, and then sets the motion track of the model, the movement of the virtual camera and other animation parameters according to the requirements. Finally, according to the requirements for the model to assign a specific material, and play the light. After this series of work is completed, the computer automatically generates the final picture. 3D animation can not only imitate the techniques of hand-drawn animation, but also go beyond the traditional concept of "original painting and animation". Nowadays, the

traditional hand-painting can no longer satisfy the audience's visual enjoyment.

As early as 1982, Disney used computer 3D technology in many scenes in "Tron", which occupies an important position in the history of film technology. In 2008, the addition of Pixar changed Disney's usual approach to production. The key figures at Pixar believed that Disney should return to hand-drawn animation as well as 3D animation, and 2010's Rapunzel was born. This animated work brings us back to the old Disney style: fairy tales, melodramatic humor and song and dance. The return of these three elements undoubtedly marks the beginning of the revival of Disney animation. The subsequent production of Tangled successfully combined Disney's hand-drawn tradition with Pixar's 3D technology, using non-photorealistic rendering (NPR). While hand-drawn, it retains the depth and dimension that a computer can generate, giving the images a visual experience of oil painting. The work is seen by many as the foreshadowing of Frozen.

As Disney and Pixar became more and more harmonious, following the run-through of Rapunzel, they jointly released Frozen in 2013, which represents the highest level of animated films. The animation was a huge success both technically and artistically. Frozen takes Rapunzel's "hand-drawn +3D" formula and improves it to achieve unprecedented visual effects. If Rapunzel offers audiences a visual experience that looks like oil painting, then Frozen's expansive snow scenes show just how far Disney has come in the traditional hand drawing genre since The Lion King.

The creation of "Frozen" is based on snow. In order to make the animation scenes realistic and believable, understanding the formation, characteristics and density of snow is the basis of production. To this end, they made a snow production simulation system, and at the same time, they also used this simulation system to make Olaf the snowman snowball effect. In addition, the producers learned how to make an ice palace by observing the sunlight hitting the ice wall. They thought the formation of the ice palace was similar to the formation of a snowflake, so they used the effect of snowflakes to simulate the formation of the palace. It took 50 animators 30 hours to create a single shot of the ice palace. In addition to using a three-dimensional simulation system, some of the details of Frozen are still hand-drawn in traditional ways. Each snowflake in the film was painted by hand by a hand-drawn animator and then scanned into a computer for image correction and compositing. Over 2,000 different shapes of snowflakes were painted. In addition, in a large number of scenes showing how water turns into ice and how ice turns into water, the process of water and ice changing with each other is also mastered by hand-drawn animators through hand-drawn rhythm and shape, so hand-drawn is organically integrated into the animation production.

In addition, in the aspect of fully displaying the characters' personalities, Disney developed some new facial devices, so that the subtle changes of the characters' faces can be reflected incisively and vividly, and even the small details of the undation and change of the field when Elsa sings are not spared. The devil is in the details, and the "Frozen" team deserves the credit for their dedication to excellence. The

success of "Frozen" hasn't stopped Disney from exploring technology. The 2016 movie "Zootopia" once again demonstrated the extraordinary progress and success of Disney animation. The most prominent features of this animation are the realistic representation of animal hair and environmental vegetation in the film. The use of these techniques pushes the treatment of mammals in animated films to a new level. Of course, Disney animation has tackled the complexities of hair before, in films like Rapunzel and Frozen. But the "Zootopia" story spans 64 different species, which equates to about 80 different character models. The rabbit and fox required 2.5 million hairs each, so Disney went for the technological innovation of recreating real hair follicles for each species and combining hair creation with object movement through improvements to the example tool XGen, which added features that changed coloring properties.

In addition, in the rendering of complex hair, Disney will invest heavily in the renderer Hyperion to improve, the early development of tools as capital, and Nitro GPU together to develop shader and GPU rendering software, through Hyperion path tracking, try to optimize the hair itself. After a series of technical innovations, the final real restoration of each clearly visible animal hair. In addition, in the construction of the scene in the tropical rainforest area, the advantages of Hyperion were fully utilized, combined with the Bonsai -- vegetation generation tool used in Rapunzel for rendering, so as to achieve a realistic effect. However, accuracy down to the hair follicle level is just one example of Zootopia's technological innovation. It could be argued that innovations like these represent a major step forward in the ability to tell great stories through a combination of art and technology. As Disney himself sees it, animation is closely linked to the development of technology.

4. Conclusion

It is often said that Disney is a kingdom of animation. Since its inception, the quality and quantity of animation it has created deserve praise. The animation images it creates are distinctive and deeply rooted in people's hearts. In the process of continuous growth, Disney sticks to the tradition of traditional hand-drawn art, and makes technological innovations. The research on the production methods and artistic characteristics of its animated films is of great value and reference significance for the development of Chinese animated films and even global animated films.

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