

The Technological Evolution of Domestic Animation from the Perspective of Imaginative Consumption—Observation based on the Trilogy "White Snake"

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Abstract: With the continuous advancement of digital technology, digital film aesthetics have injected unprecedented creativity into modern animation, endowing it with richer visual language and emotional expression. Through the clever integration of technology and art, domestic animated films have not only become a carrier of visual feasts, but also an important bridge for cultural inheritance and emotional resonance. Represented by the White Snake Trilogy, domestic animated films have inherited traditional culture and integrated advanced technology, forming a unique aesthetic style. This style not only showcases the profound cultural heritage of the nation, but also presents an animated expression that combines international perspective and local temperament.

Keywords: Animation; Film; Digital Technology; Special Effects; Domestic Animation; Film Technology; Imagination; Consumption

1. Introduction

Animated films are an intermediate theory that carries the dual genes of art and technology. Their unique technological genes determine that animation creation in different historical periods is always inseparable from the technological means at that time. Every technological innovation brings new vitality and forms of expression to animation performance, driving creativity to new heights. The process of animation performance creation is actually a profound transformation of animation narrative from textual information to visual information. It is not only an intuitive presentation of text, but also an artistic practice of creators deconstructing and reconstructing the emotions and meanings behind text through the actions and expressions of characters. In this process, the performance of animated characters not only reflects the creator's reproduction of real life, but also demonstrates their unique understanding and clever control of time and space [1]. This transformation, as revealed by the film revisiting theory, often involves animation as a part of the film language, constantly revisiting known cultural symbols and narrative patterns through technological advancements and artistic innovations, and giving birth to new visual expressions through reflection and reconstruction. Every technological update provides richer creative methods for animation performance, and at the same time, creators' understanding of time flow and spatial jumps in it enables animation storytelling to transcend traditional linear structures, giving it more layers and fluidity. Therefore, animation performance is not only an artistic presentation of reality, but also an examination and reconstruction of traditional narrative methods under the dual effects of digital technology and creator innovation. It is not only a retrospective of the past, but also an exploration of the future.

Entering the 21st century, domestic animated films are gradually catching up, especially with the introduction of 3D technology, which greatly promotes the technological innovation of Chinese animation. In 2015, "Journey to the West: The Monkey King Returns" became the first fully 3D animated film in China to achieve technological breakthroughs in hair rendering, lighting rendering, and other aspects, successfully achieving a breakthrough in market profitability and marking the official entry of domestic animated films into a new era that emphasizes both technological innovation and cultural inheritance [2]. The subsequent film "Ne Zha: The Birth of the Demon Child" broke the box office record of Chinese animated films, proving the dual rise of domestic animation in technology and market. In this context, Chasing Light Animation, as one of the important production companies that have emerged in recent years, has become a representative of domestic animation technology innovation and cultural creation. Yu Zhou [3], the founder of Chasing Light Animation, mentioned that the success of Chasing Light Animation lies not only in technological breakthroughs, but also in its adherence to the creative concept of "Chinese team, telling Chinese stories well for Chinese audiences", making it an emerging force in the global competition of Chinese animated films.

Especially in works like the White Snake Trilogy, the combination of technology and culture presents a highly innovative appearance, promoting the modernization and transformation of traditional Chinese culture. In this process, digital technology not only meets international standards in visual effects for animated films, but also injects new vitality and emotional tension into traditional stories through exquisite technical means.

2. Progress in Animation Representation and Motion Capture

The classic definition of animation is to "give life to inanimate objects". Through this definition, the concept's premise can be interpreted: firstly, animated characters are created as lifeless images, and their appearance is detached from the everyday reality; Secondly, lifeless images require movement to shape characters, with the aim of endowing them with "life". Therefore, this classic proposition has always held an important position in the definition of animation.

Specifically, we can divide animated movies into 2D animation, 3D animation, and CG animation. After many years, flat animation has always held a traditional and stable position in the long river of animation art. This type of animation is mostly carefully crafted through traditional hand drawn methods and is also known as 2D animation. In the wave of digital media, 3D animation stands out with its three-dimensional visual effects and is known as 3D animation. 3D animation is the crystallization of digital technology advancement, representing an innovative form of expression in the animation field in recent years. CG animation not only includes 2D flat animation, 3D animation and other animation forms, but also organically integrates still and dynamic images [4]. The trilogy "White Snake" utilized advanced CG technology in animation production, resulting in delicate and smooth visuals. The use of motion capture technology also made the characters' expressions and movements more realistic and vivid.

Hayao Miyazaki extensively employs traditional hand drawn animation in his works. For Hayao Miyazaki, traditional hand drawn animation is not only a production technique, but also an artistic expression and concept that deeply integrates the creator with the content of the work. As a result of rational choice, Hayao Miyazaki endowed traditional hand drawing with special meanings (life, respect) and provided new interpretations of it in his own works [5].

In 2023, Bilibili's "Chinese Tales" tells eight independent stories rooted in traditional Chinese culture. The themes cover a wide range of topics, from nostalgia for the countryside to post apocalyptic sentiments, from caring for life to contemplating human nature, creating a world full of Chinese imagination and showcasing the charm of Chinese culture that transcends time and space. Thanks to its high-quality content, "Chinese Qitan" won the Best Animated Script Award at the 28th Magnolia Awards [6].

In the White Snake Trilogy, this kind of "animated expression" is deeply reflected. Through delicate visual style and exquisite character design, the film not only reproduces classic elements of traditional Chinese culture, but also showcases the emotional fluctuations of characters and the development of the story through animation. For example, in "The White Snake: Origins", when faced with the great battle between the national teacher and the snake tribe, Xu Xuan sacrificed his life to save each other, and through delicate facial expressions and rich body language, he obtained a true and touching expression. Animation conveys a deep emotional connection between characters through their eye contact, body movements, and emotional fluctuations. This expression technique allows the audience to more directly feel the inner world of the character, rather than just through dialogue or actions themselves. The action is portrayed in "White Snake 2: Rise of the Green Snake", where the animator uses intricate motion design and magnificent battle scenes to vividly showcase the power and agility of the Green Snake. In the final stage of the Asura Castle, Xiao Qing and Xiao Bai (a masked boy) engage in a life and death battle against a ghost monster, which is also a high tide part of the film. Through animation techniques, actions are not just physical representations, but also extensions of emotions and power, making every battle full of visual impact and emotional tension. The core of animation expression lies in its ability to transcend the limitations of reality through rich creative techniques, allowing the audience to more directly feel the characters' inner emotions, the development of the plot, and the expression of the film's theme. Through these exquisite animation performances, the White Snake Trilogy not only presents a beautiful story world to the audience, but also deepens the expression of emotions and the presentation of themes through this representational behavior, making animation a more rich and multidimensional artistic medium.

Motion Capture, also known as motion capture, is a technology that records and converts the motion of objects, especially human bodies, into digital data. It can be traced back to 1914 when animation master Max Fleischer developed a projector that projected film content onto a transparent platform. Animators then drew character movements [7] based on the shape of the image, known as "rotoscoping". Initially, this technology was mainly used for animation production and game development, but now it has been widely applied in many fields, including sports science, medical rehabilitation, virtual reality (VR), augmented reality (AR), military training, and robotics technology. Motion capture technology installs markers or sensors on the body of the captured object, and uses cameras or sensor arrays to capture the three-dimensional position data of these markers or sensors, which is used for analysis and application.

The advantage of motion capture technology is that it can directly capture real-life performances, which not only saves a lot of production costs and time, but also makes the character's movements more natural and realistic. Compared to motion capture technology, a series of operations such as painting, modeling, and rendering are very time-consuming and labor-intensive. Sometimes designing character movements can be difficult and not easily achieve the expected effect. In the field of traditional film and television production, whether it is 2D animation or 3D animation works, the dynamics and expressions of characters often rely on animators manually adjusting or carefully crafting them through software manipulation of skeletal structures and control components. However, in the face of the rich diversity of human movements and expressions, coupled with the fact that animators are not professional actors, this artificial creation or adjustment method often fails to capture the realism and vividness of characters. At the same time, this method also leads to an extension of the production process, a decrease in efficiency, and difficulty in achieving immediacy.

In the field of motion capture, optical motion capture is the most common and mature technology. The optical motion capture system uses infrared cameras to capture the motion of passive reflection markers, or uses actively illuminated LED markers. The main advantages of optical motion capture are its high precision and resolution, which can capture very subtle motion details, thus it has been widely used in film and game animation production. For example, many action scenes and character performances in Hollywood movies rely on optical motion capture technology.

The advanced motion capture technology used in *Avatar* (2009) not only preserves the actors' superb acting skills, but also perfectly interprets the characters' emotional world. The most amazing thing about this technology is that it can capture every subtle aspect of an actor's emotional expression - whether it's a slight tremble, an unintentional blink, or a subtle change in gaze, all of which are accurately captured and integrated into CGI character animations. This breakthrough has directly given rise to a new branch of facial motion capture. As the name suggests, facial motion capture is the use of cameras or laser scanners to convert a person's facial expressions into digital signals, thereby generating realistic computer animated faces. This process greatly simplifies the most challenging part of animation production - capturing and reproducing real human emotions, providing the possibility to create motion capture characters that can touch people's hearts and be unforgettable.

In film production, motion capture technology enables directors and animators to create more realistic and complex characters and movements. For example, actors can wear motion capture devices to perform their characters' actions and expressions, and the motion capture system will record these actions and convert them into 3D animation data. Then, animators can make further modifications and optimizations based on this to generate the final animation effect. This technology greatly improves the efficiency and quality of animation production, reducing the workload of manual drawing and adjustment. Therefore, character animation produced using motion capture technology (the design and animation of character movements, or the performance of animated characters) is a type of character animation that directly imitates real person movements through photography.

Taking the domestic animation "*Ne Zha: The Birth of the Demon Child*" (2019) as an example, the production team of the film not only used dynamic capture technology, but also combined traditional aesthetic elements in China, opening up a new path for the localization exploration of dynamic capture technology. The action design incorporates elements of domestic martial arts, making the character's movements more in line with the aesthetic habits and cultural expectations of domestic audiences. In addition, the application of dynamic capture technology in the film is also reflected in the capture of details, such as expressions and

gestures, which require not only precision but also the ability to capture subtle expressions and movement rhythms unique to domestic performing arts.

Overall, motion capture technology is moving towards high precision, wide application, low cost, and intelligence. With the continuous innovation of technology and the expansion of its application scope, motion capture technology will play a key role in multiple fields and demonstrate enormous development potential.

Specifically, the application of animation capture technology requires specific problem analysis. Director Huang Jiakang stated, "In 'White Snake 2', we made a significant adjustment to the motion capture technology, which is equivalent to only using motion capture technology in the construction of the model's basic framework. This allows the animators to have sufficient room for adjustment, making it look less like a real person. 'In order to solve the problem of stiff facial expressions and insufficient emotional richness in' White Snake: Origin ', the team adopted more flexible motion capture technology, and the animators combined manual k-frame adjustments with basic data provided by motion capture to achieve more exaggerated evolution and changes, achieving a Chinese style restrained and emotionally rich expression. In 'The Legend of the Green Snake', the facial expressions of the characters have evolved from the original five movable parts to more than twenty parts, making the expressions more rich and natural, conveying more subtle emotions, and balancing authenticity and artistic style in animation performance. Director Huang Jiakang said, "When I was working on 'White Snake: Origins,' I didn't want to make overly Disney style exaggerated expressions, but there was still room for improvement in some subtle performances. So, when we were working on 'The Legend of the Condor Heroes,' we kept the restrained expressions, which would express our inner selves more, have rich but not exaggerated expressions, and be more in line with Chinese aesthetics. I wanted the audience to not feel like they were watching a Disney animation when watching 'The Legend of the Condor Heroes,' but they would also feel that it was of high quality. This time, when we were making expressions, we used motion capture [8].

3. Iteration of Complex Special Effects and Dynamic Simulation

With the continuous innovation of Internet technology, the transformation from simple special effects to complex special effects has become an integral part of the topic. With the rapid development of special effects technology, animated movies have witnessed a seamless integration from simple filter applications to complex 3D animations, and finally to virtual reality. Each step of the climb is accompanied by a significant increase in data processing volume and a great improvement in processing speed. Simple special effects often give people a sense of perfunctoriness or cheapness, while complex special effects can bring the audience a more immersive realism. The Lion King is the first Disney animated film to show the CG "dust simulation" effect. This CG "dust" effect appears in The Wind for the second time, in Mount Taishan for the third time, and in The Legend of the Bear for the fourth time. Dust "represents the bridge between hand drawn animation and CG, and is one of the most complex examples of the fusion of two different ways. The "dust" in the stampede of the horned horse in the film particularly tests the level of the special effects artist. In order to create the milestone "dust" effect, the team used CAPS. It is a new computer animation production system designed by Disney and Pixar, aimed at simplifying the coloring process and introducing techniques such as transparent shadows and unrestricted colors. The introduction of digital synthesis enables rendering to be delivered to CAPS.

Randy Fullmer, the artistic coordinator of The Lion King, is responsible for the animation department and CG Communicating between departments, he once explained the specific process and technical complexity of producing "dust effects": "Dust is very soft, so opacity needs to be added to it to show its softness. Just like in a stampede or when the picture shows something like Mufasa being killed, it usually starts with a cloud of opaque dust because it plays a role in revealing the plot like a stage screen. Then it may have a slight transparency, about 90% opacity. As time goes by, let the dust dissipate, and then continue to decrease the transparency of the dust, such as 20%. The dust is still there, but gradually dissipates and blends into the atmosphere, at which point the audience can see what just happened [9]. When we talk about movie special effects, an indispensable work is Avatar, which is one of the milestone works in the history of 21st century cinema. From the perspective of the use of special effects, 'Avatar 1' led the technological revolution in film and also made film special effects a key factor affecting film quality and box office in the future In the

movie Avatar [10], the outstanding display of animation special effects is attributed to the application of a series of cutting-edge technologies: computer-generated imagery (CGI) technology endows the film with a lifelike virtual world; Digital image processing technology is meticulously crafted to achieve ultimate clarity and texture in every frame of the image; And digital image synthesis technology cleverly seamlessly connects reality and fiction, weaving together breathtaking visual feasts.

The trilogy of "White Snake" in Chasing Light Animation demonstrates a high level of technical expertise and artistic innovation in special effects design. The whole story pursues a deep integration with the emotions of the story and Eastern aesthetics. Special effects are not only for the visual impact, but also for serving the storytelling and emotional communication. For example, at the beginning of the movie "White Snake: Floating Life", a watercolor hand drawn scene quickly reviews the main plot of Ah Xuan's sacrifice to save Xiao Bai in the first film "White Snake: Origin". The use of this style adds a classical beauty to the movie; The mount of Fahai, the Golden Haired Pony, is an important special effects design in the film. It usually transforms into a bracelet of 12 Buddha beads and reveals its true form when encountering demons. This design not only embodies the mystery of Eastern mythology, but also adds visual impact; In the plot of Loong Boat Festival, Xiaobai shows his true shape by drinking realgar wine blessed by Fahai. In this plot, the special effects design simulates the first perspective POV of a white snake's body, bringing an immersive experience to the audience; Xiaobai went to Kunlun Mountain to search for the revived Lingzhi fairy grass in order to save Xu Xian. During this process, the special effects design showcased the mystery and steepness of Kunlun Mountain, as well as the battle between Xiaobai and the Crane Boy guarding the fairy grass; The master of Baoqing Fang performed the role of the matchmaker in "The Romance of the Western Chamber" in the film. The special effects design of this scene not only showcases the beauty of traditional Chinese opera, but also cleverly integrates into the plot, adding cultural depth to the film; In the climax of the film, Xiaobai reveals his true form as a python, and his emotional exchange with Xu Xian showcases the cycle of life and the deep affection of past and present lives; At the end of the film, the green and white snakes roll up huge waves and flood Jinshan. In their final battle with Fahai, the special effects design presents a grand scene and stunning visual effects, bringing a climax to the entire series. These special effects designs not only enhance the visual impact of the movie, but also provide strong support for the emotional expression of the story. Through these carefully designed special effects scenes, the audience can deeply feel the charm of the love legend and Eastern mythology in "White Snake: Floating Life". All demonstrate the superb skills of ray tracing animation in special effects production. When designing, the special effects team will determine the elegant and refined style of everyday life from the perspective of characters and serialization. They will try their best to 'empty' themselves a bit and not be influenced by their past works, because there are multiple versions of the story of White Snake, and what Chasing Light Animation needs to do is to capture the personalities of Xiaobai and Xiaoqing, and let them face the contradictions in the main story.

In the "Black Wind Cave" section of "White Snake 2: Rise of the Green Snake", the scenes depicting the four seasons have been iterated in 95 versions, reflecting the ultimate pursuit of technical details in the light chasing animation. When Chasing Light Animation was still widely used in the industry for offline farm rendering, it was the first to explore more economical and efficient rendering methods. With the help of Tencent Cloud, it moved the key visual effects to the cloud, greatly improving rendering efficiency.

If the grand animation effects make the overall feeling of the work grand, the dynamic simulation in animation focuses on depicting details. In animation, not only characters and animals need to be portrayed, but these characters also need to be placed in a certain environment. Effects such as smoke and flames are part of natural scenes, and their representation plays an important role in adding realism and creating atmosphere to the animation. Due to the highly irregular shape of smoke and its high degree of motion randomness, dynamic simulation of smoke has always been one of the most challenging problems in computer graphics[11].

This is because the appearance and shape of fluid phenomena such as smoke and clouds are extremely irregular, they do not have smooth surfaces, and will change over time. That is to say, if we use classical Euclidean geometry to depict it, it will actually appear powerless. If we use lines, arcs, and curves to represent or model it, it will undoubtedly affect the realism of the animation.

Therefore, in the algorithm research of computer graphics, the simulation of fluids such as smoke, water flow, and flames is also a challenging and fascinating problem. For example, in "The Avengers," there is a

scene where a character's body is engulfed in flames, and then the flames burn fiercely, completely covering the character's body. From this, it can be seen that this type of scene requires a high degree of integration between characters and scenes, so as not to make the audience feel disconnected and unfamiliar.

With the increasing number of fantasy and hero films in recent years, the technique of dry for wet filming has become widely used. Due to the ability of the production team to create highly credible underwater scenes through lighting, smoke and other effects inside the studio, or with the assistance of computer animation, the team can shoot realistic underwater scenes in a safer and more stable environment. Taking the movie "The Shape of Water" as an example, the initial river scenes were produced by Mr. X Digital, a visual effects company based in Toronto, while the rest were shot in a waterless environment at the Cinespace studio using Stannikon. During the filming, Hawkins and some props were suspended by a Weiya, and two 20000 lumens projectors were used to create ripples and underwater lighting effects. The use of smoke further enhances the feeling underwater. The visual effects produced by this special effects look very realistic, and we connected the image with the real scene by matching the camera movement, "explained Dennis Berardi, the visual effects director and CEO of Mr. X. The live action footage was reshoot in the hallway, and we created digital transitions to match the scene designed and arranged by Paul [12]. In "White Snake: Origins", dynamic simulation technology is used to showcase the emotional development between Xiaobai and Axian. For example, when Ah Xuan encountered a scene where his form and spirit were completely destroyed and his soul was scattered in the national teacher's formation, Xiao Bai used a hairpin to capture the last strand of his soul. Dynamic simulation technology made Xiao Bai's movements and expressions full of urgency and emotional tension, bringing strong emotional resonance to the audience. In the field of animation, reproducing the feeling of weightlessness underwater is a technical challenge, with the key being how to accurately simulate the rapid movement of characters, special effects production, and the natural dynamics of fabric fluctuations with water. The special effects team of ray tracing animation has explored various technical paths, such as simulating fluid collisions and the effects of characters releasing fluids. They ultimately combined the advantages of these two methods to form a comprehensive solution. In addition, the character has been designed with a special force field, which not only presents speed changes in the surrounding ink effect, but also varies with the character's movements. In the end, in order to ensure that the dynamics of the ink effect are more realistic, the team customized a suitable physical environment for the ink special effects, rather than simply using a standard vacuum environment.

In the second part, dynamic simulation technology is used to showcase Xiao Qing's adventure and growth. The battle scenes of Xiaoqing in Shura City, as well as her interaction with the masked person (a strand of Little White's soul), showcase the character's flexibility and sense of power through dynamic simulation technology, making the action scenes more realistic and thrilling. Especially in the opening scene of "Water Over the Golden Mountain", dynamic simulation technology is used to showcase the unscientific and rhythmic dynamics of water, as well as the waves filled with traditional Chinese elements, each of which must have "power" and "consciousness" [13]. Another example is the battle between Xiaoqing and the masked man in the "Shura Fantasy Realm", where dynamic simulation technology showcases the dynamic interaction of characters and feedback from the environment, increasing the realism and viewing value of the battle scene.

In the work "White Snake: Floating Life", the performance scene of the Baoqing Fang master cleverly uses dynamic simulation technology to realistically reproduce the flowing and swinging of the fabric. In order to ensure the authenticity and credibility of the performance and avoid relying on spells, the production team carefully designed a series of mechanical devices aimed at creating a stage effect that is both shocking and atmospheric. These detailed simulations of fabric dynamics not only enhance the realism of the scene, but also greatly enrich the visual effects.

Throughout the trilogy, the actions and expressions of the characters are finely presented through dynamic simulation technology. For example, the agile movements and subtle changes in facial expressions of characters during battles are achieved through dynamic simulation technology. This technology makes character performances more vivid and realistic, enhancing the audience's sense of immersion. The special effects team also uses particle systems to simulate special effects such as magic, smoke, and flames. The dynamic simulation of these special effects adds visual impact to the battle scenes and magic displays in the film, making these scenes even more exciting. The application of these technologies not only enhances the visual effects of animation, but also provides strong support for the emotional expression of stories.

4. Improvement of Material Texture and Detail Processing

Under the current trend of diversified aesthetic pursuit, visual aesthetics play a crucial role, especially in the "image reading era" we are in. The importance of visual aesthetics has been pushed to a new height. For animated films, visual aesthetics are not only a core experience provided to the audience, but also have a decisive impact on the film's reputation and box office performance. When filmmakers produce complex animated films, they often encounter many technical difficulties, and material texture and detail processing are major challenges. Firstly, from the perspective of material texture, animators cannot ignore the difficulties of skin and hair when creating new character models. Many character creatures or scenes use hair module technology, such as the birds in movies like "King Kong" and "Avatar", as well as characters like Judy and Nick in "Zootopia". With the support of realistic fur, the model can maximize the realism of animated characters.

From the current perspective, hair rendering has always been a weakness in domestic CG production. On the one hand, this is because there is still a gap between domestic animation production technology and world-class level. On the other hand, the high cost of rendering each frame of the image has put forward higher requirements for the cost of movies. Overall, a series of animated movies in Hollywood are at the forefront of the world in terms of material texture and detail processing. For example, in the 2016 film Zootopia, the main characters Judy Rabbit and Nick Fox each have up to 2.5 million hairs, while the giraffe character has 9 million hairs, and even a small sand rat has 480000 hairs.

In order to achieve the final construction goal, Disney added a "fur mode" to the unique ray tracing feature of the renderer Hyperion, which perfectly reproduces the lighting effect on the fur of different animals. In order to pursue the ultimate delicacy of modeling, when animal models are placed in different lighting environments and exhibit diverse movements and expressions, their fur texture also presents rich changes. Therefore, carefully observing the true fur condition of the rendered object and maximizing the sampling rate are the two key points to achieve a realistic effect in fur rendering. KerSavage, the visual effects director of Zootopia, said, "We visited many zoos, including wildlife parks." "We went to places where we could observe and interact with these animals up close, and we also went to the Natural History Museum where we could carefully touch the fur and even observe it under a microscope to correct the fur texture we had imagined before [14]. Based on these detailed observations of animal hair, animators render on the computer, like weaving cloth, outlining the shape of each hair stitch by stitch, shaping them one by one, and finally converging into a smooth and complete fur.

In recent years, domestic films have also achieved certain results in the presentation of hair texture. In the 2015 domestic animation "Journey to the West: The Monkey King Returns", the film was produced with great care. For example, after Jiang Liuer met Da Sheng, he walked together all the way, and his hair slowly grew more and more over time. From the perspective of detail processing, "The Return of the Monkey King" is also a remarkable masterpiece, with the "A-level special effects shot for the melting of stones, which has been improved in more than 30 versions and added effects such as magma and Mars". This makes the entire melting process present a more refined texture and realistic effects. At the same time, the final 15 minutes of the film's ultimate showdown pushed the tense and exciting atmosphere to a climax. There are over 380 lenses in total, including more than 150 A-class lenses [15].

Chasing Light Animation began using the new Arnold 5. x as the rendering kernel in "White Snake: Origin". This marks a significant upgrade in rendering technology for ray tracing animation and is also one of the earliest companies in the industry to use this new version of rendering engine. In "White Snake: Origins", the rendering time for many shots reached an astonishing 4000 kernel hours (machine cores * rendering hours). This number even exceeds the rendering time of Dead Town in Pixar's "Coco," demonstrating the dedication and pursuit of quality in rendering for the "Chasing the Light" animation. In terms of material rendering, "The White Snake Trilogy" showcases the ultimate pursuit of detail, striving to achieve realistic effects in terms of character skins, clothing, and environmental materials.

From the first installment of "White Snake: Origin" to the third installment of "White Snake: Floating Life", the five-year advancement of Chinese animation technology has brought a qualitative leap to the film. Director Li Jiakai mentioned that one of the most intuitive changes is that the hair strands have become thinner than before, indicating a significant improvement in the details and realism of the hair [16]. Technological

advancements have also helped the team better shape the characters, endowing them with vivid and elastic qualities. For example, Li Gongfu's belly undulates with his breath, two cranes are full of playful vitality, and there is a round bodied golden haired python. These characters' exaggerated movements and expressions were not daring to try five years ago, but now the leap in technology allows creativity to be fully unleashed. The image design of Qingfang Master cleverly blends the face of a young girl with the head of a cunning old fox, creating a unique charm with both sides. This design not only retains the mysterious and dark temperament of the fox spirit tradition, but also emphasizes its enchanting and charming qualities through the use of colors such as red and pink. Her image exudes both classical beauty and modern charm, making her an extraordinary character with both traditional charm and modern atmosphere. The use of hair texture here enhances the character's sense of mystery and seductive qualities. When the characters move, the changes in clothing are real and elegant, such as when Fahai's robe is soaked in water, the color and texture show extremely subtle and delicate changes. This demonstrates the dynamic expression of material texture in animation, allowing clothing to maintain realism in different states.

Nowadays, domestic animation film creation teams are not only able to produce very mature 3D depth of field effects, scene design, script design, etc., but also able to use the essence of Chinese culture to depict animation images that conform to contemporary aesthetics [17]. There are many folk details in *Big Fish and Crabapple*, which was released in 2016. "The main character Chun's dress is a traditional dress with Chinese Han style. In addition, there were Loong Boat, oil paper umbrellas, lanterns, sachets and other objects with Chinese cultural characteristics in the film" [18], including a music clip of Peking Opera singing. Nezha is the hero of a well-known mythical story, and is loved by many countrymen for his rebellious nature. The film "*Ne Zha: The Birth of the Demon Child*" that emerged in 2019 provided a groundbreaking "second creation" to the story of Ne Zha, and was also the first domestic animated film to be released in IMAX format. "As many as 20 special effects production companies and 1600 creators participated in this film, setting a new record for domestic animation at present. The animation team used Maya or ZBrush to meticulously model characters such as Nezha. Many special effects shots are even more expensive, such as the scene of Nezha transforming with a lot of flame effects, which highlights the transformation of 'Ugly Nezha' into a passionate hero in the flames [19].

The *White Snake Trilogy* has made adjustments based on traditional stories, emphasizing the modern transformation and innovative expression of traditional culture. The art style of the three films is based on classical Chinese painting, presenting the spirit of Chinese aesthetics and effectively attracting and infecting a wide audience. From the modernization of details to the modernization of ideological tone, it has expanded to gender equality, and further extended to a broader contemporary reality dimension. This 'modernization' in terms of ideas and themes is actually the consistent goal of the trilogy. In terms of script design, the *White Snake Trilogy* cleverly incorporates modern elements and novel plot settings while retaining the essence of the original work. It not only tells a love story spanning thousands of years, but also reveals the brilliance and darkness of human nature through delicate brushstrokes, as well as profound reflections on love and sacrifice. In terms of scene design, whether it is antique architectural scenes or colorful special effects, they all demonstrate the production team's ultimate pursuit of details and quality. This visual representation not only provides the audience with great enjoyment and satisfaction visually, but also makes them feel the rise and progress of Chinese animation. The facial expression design of the characters is also quite meticulous, and the facial designs of the main characters Bai Niangzi and Xu Xian in the film are in line with their personality traits. The gentleness and kindness of Bai Niangzi, as well as the determination and deep affection of Xu Xian, are perfectly expressed through facial expressions. The delicate changes in facial expressions can reflect the emotional changes of the character. For example, every frown of Xiaobai implies different emotions, such as a sense of crisis, unease, disgust, and emotion. The depiction of these details makes the character's performance more three-dimensional and vivid.

The term 'visual feast' is aptly used to describe '*The White Snake: Origins*'. The painting style of Oriental Charm is mainly reflected in several scenes such as ink painting, West Lake scroll, fixed waves on a regular plate, fixed emotions on the top of the tower, tribute at the end of the film, and the dancing of dandelions in the "honeymoon period". The high standards of colorkey and Matte Painting, combined with the precise expression of water waves, wind, petals, etc., make the final image present an excellent Chinese style texture [20]. In *White Snake: Origins*, the scene design reflects rich Chinese cultural elements, such as Yongzhou

City in the late Tang Dynasty. Yongzhou City in the film is brilliant, especially the large arch of wooden architecture building, which is obviously a symbol of Tang architecture. This design not only showcases the characteristics of Tang Dynasty architecture, but also reflects the style of ancient Chinese cities. In the red maple forest, Ah Xuan and Xiao Bai held an oil paper umbrella and shuttled among the dandelions, dancing one after another in the air [21]. This scene not only highlights the essence of Chinese classical aesthetics, but also deeply expresses the praise of traditional Chinese culture for the beauty of nature. Baoqing Fang, this dazzling and fantastical place, is like a double-sided mirror interweaving reality and fantasy, and its internal mysteries are awe inspiring. There are countless Rubik's cubes embedded in the walls, as if they are the crystallization of wisdom, while the Five Elements Eight Trigrams pattern on the floor reveals the essence of ancient Chinese philosophical thought and architectural art. In the latter half of the film, all the three dimensionality seems to quietly fade away, and the distant scenery loses its distinct contours and turns into a vivid ink painting. The "Endless Blue Lotus Leaves" of Jiangnan Water Town is perfectly interpreted here, with rich colors and flowing ink painting intertwined, showcasing the aesthetic spirit of traditional Chinese ink painting to the fullest. The design of this scene is not only a tribute to traditional Chinese art, but also a profound reflection of the harmonious coexistence of nature and culture. It allows us to rediscover the art and wisdom flowing in the blood of the Chinese nation in modern imaging technology.

5. Conclusion

With the continuous development of digital technology and technological innovation in domestic animated films, the combination of traditional culture and modern creative methods is bringing unprecedented opportunities and challenges to Chinese animation. In the success of works such as the White Snake Trilogy, we not only see breakthroughs in technology in motion capture, special effects design, dynamic simulation, but also profound expression and innovative inheritance of cultural connotations. Through exquisite technology and artistic means, domestic animation is presenting a unique aesthetic style that combines international perspective and local temperament. They are no longer just tools for entertainment, but carry the profound heritage of Chinese culture and unlimited potential for future development. With further technological advancements, domestic animated films will be able to delve deeper into and convey the essence of traditional Chinese culture, while incorporating more diverse creative concepts and innovative elements. The continuous improvement of technology, whether in visual effects, emotional expression, or in detail processing and character portrayal, will bring richer expressive power to animated films. In this globalized cultural context, domestic animated films will showcase the unique charm of Chinese culture to the world through more refined craftsmanship and innovative narrative methods, and further promote the rise of the Chinese film industry on the global stage.

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