

# Research on Animation Visual Innovation Integrating Traditional Hand Drawing Style and 3D Virtual Reality Technology

Ziye Lin

Glasgow school of art, Glasgow, UK

## Abstract

With the rapid evolution of digital technology, the traditional hand drawn style is facing a transformation bottleneck in the field of animation. However, 3D virtual reality (3D VR) technology, with its unique charm of immersive experience, has opened up a new path for visual innovation in animation. This article will focus on the integration mechanism between traditional hand drawn styles and 3D virtual reality technology. From the core dimensions of visual feature deconstruction, technological advantage mining, fusion contradiction analysis, innovative performance extraction, and practical case verification, the research finds that the two have successfully achieved a deep coupling between "hand drawn temperature" and "technological accuracy" through technological paths such as line texture replication, color space reshaping, and interactive scene adjustment. Research has confirmed that this fusion not only breaks the inherent constraints of traditional animation flat narrative, but also strengthens the audience's deep emotional resonance through immersive interaction, providing a solid theoretical basis and feasible practical paradigm for the modernization of animation visual language.

## Keywords

Traditional Hand Drawn Style; 3D Virtual Reality Technology; Animation Visual Innovation; Integrated Path; Immersive Experience.

## 1. Introduction

In the evolution of animation art, traditional hand drawing, with its delicate lines, warm colors, and unique texture, has become a classic visual identity for works such as *Spirited Away* and *The Secret of the Kael Sutra*. Its recognition has been widely recognized by global reputation and industry analysis. With the deepening of the digital age, the visual needs of the audience have shifted from one-way reception to diverse participation. According to iResearch's "2024 Annual Report on China's Animation Industry", the core audience of Generation Z has a demand for "interactivity" and "immersion" exceeding 60%. 3D virtual reality technology, with excellent modeling, immersive scene construction, and real-time interaction, has become a key direction for animation visual innovation [1]. However, pure 3D animation tends to have a "mechanical feel" due to excessive reliance on technology, and the clustering of themes leads to "homogenization". The industry is gradually thinking about the quality of content; The traditional hand drawn "handmade texture" and creative personality are the key to breaking the deadlock, and international research has also proven that its line tension and emotional transmission value are difficult to replace. Academic research is often limited to a single dimension: animation studies focus on hand drawn aesthetics, while the computer field focuses on 3D technology. The exploration of the integration of the two is scarce, and there is a lack of interdisciplinary integration of "technology content experience". In fact, the two complement each other significantly. How to promote their coexistence through technological innovation, adhere to the humanistic core of hand drawn animation, and enhance the visual and interactive experience of animation has become an urgent issue that needs to be solved in the industry.

This article combines animation practice, graphics principles, and artistic laws to explore the path of integrated innovation and help the industry..

## 2. Analysis of Visual Features of Traditional Hand drawn Animation Style

The soul of traditional hand drawn animation lies in every line that speaks. The painter held the pen and dropped the paper, and the agile strokes injected vitality into the characters and scenes - in "Sakura, the Magic Card Girl", Sakura waved her wand with delicate lines like the wind, enveloping her playfulness; The brushstrokes while running carry a sense of jumping, conveying the adventurous spirit of youth. In 'Princess Mononoke', the lines that outline the forest have changed, rough with a hint of roughness, like the marks of time carved on the bark of trees. Viewers can feel the roughness of the bark and understand the ancient weight of the forest as they look at these patterns. These handmade lines are not confined by the geometric framework of 3D modeling, and every turn and weight is wrapped in the artist's breath. The audience looks at them as if they have touched the artist's heart through the screen, laughing and grieving with the characters [2].

If lines are the bones of hand drawn animation, then color is its soul - unlike 3D animation that relies on physical light and shadow calculations, hand drawn color is a projection of the creator's imagination. The clarity of watercolor, the density of crayons, and the blending of ink and wash can always create a unique atmosphere. The daring use of red and gold to create a fiery red scene in 'The Great Chaos in the Heavenly Palace' is the inherent resistance of Sun Wukong; Golden and luxurious, set against the majesty of the heavenly court, two colors are splashed out, spreading the grandeur of mythology before the eyes, and the audience is immediately enveloped in that passion. The Song of the Ocean, on the other hand, blends the blue and gray tones with the sea and sky, and the low brightness colors blend in a hazy way, hiding the loss and search in family love in the picture. The audience looks at the blue and their hearts sink into the loneliness of the characters. Hand drawn colors, regardless of the rules of real light and shadow, only follow the story and are the most direct emotional symbols that touch people's hearts.

The most touching aspect of hand drawing is the smoky "imperfections" - the patterns on paper, the particles of paint, the fine strokes of pencil lines, and the blurred hues of watercolor - all of which are unique imprints. Even in the digital age, artists will use scanning and digital tablets to preserve this texture: the outline of the pencil hook still carries a simple softness, the watercolor scenes are still dreamlike, and the charcoal drawn characters hide a heavy power. In 'The Secret of the Kael Sutra', the intricate Celtic patterns still retain the warmth of hand drawing, and the old craftsmanship comes to life in the new animation. The audience is not just watching stories, but more like holding a handmade craft and savoring the warmth of traditional art, unable to help but cherish it.

## 3. Advantages of Animation Visual Representation in 3D Virtual Reality Technology

3D virtual reality technology is like a skilled craftsman, relying on fine modeling, physics engines to accurately calculate light and shadow trajectories, and then using panoramic rendering to present the picture, firmly holding the three-dimensional space beyond reality in front of the audience. Just like the desert in the VR animation "Sand Lamp", the undulations of sand dunes, the flow of light and shadow, and even the elusive perspective in the air are replicated in almost 1:1 reality by 3D technology - when the audience wears the device, their gaze can rotate 360 degrees around the scene, and their fingertips seem to touch the roughness of the sand grains. This immersion is difficult to achieve in traditional flat animation. For fantasy and science fiction themes, this technology opens the floodgates of imagination even more: to

create a universe planet, strange landforms grow in the modeling, and interstellar warfare ignites in the engine; To build a magical forest, let glowing plants adorn the branches and mysterious caves hide in the forest. As soon as the audience steps in, it feels like they have truly fallen into a world full of magic, and the expressive power of the animated scenes doubles.

It not only creates scenes, but also transforms the audience from "spectators" to "participants". Traditional animation is narrated according to fixed lines, but 3D VR can use motion capture and gesture recognition to allow viewers to interact with the scene by reaching out. In Pearl, holding a controller can accompany characters to overcome difficulties and solve puzzles, and even the lighting and viewing angles can be adjusted by oneself. It's no longer a one-way story, but a two-way dialogue with animation - there may be unseen plot clues hidden at the corners, and touching more scene elements triggers new plots. Every interaction hides surprises, and the emotional immersion also deepens [3].

For animation production, this technology is a powerful tool for improving efficiency. Traditional hand drawing requires drawing hundreds of original drawings to assemble a character's movements, while 3D technology can use bones to bind and build the character's "skeleton", and then use motion capture to "paste" the real person's posture onto it, generating smooth dynamics in the blink of an eye and allowing real-time preview and adjustment. When making big movies, create characters in batches to save on hand drawing effort; When making TV series, quickly set up scenes and modify animations, without having to redraw a bunch of strokes like hand drawing. Not only does it save costs and speed up progress, but more importantly, it can steadily support the large-scale production of hand drawn styles - allowing warm hand drawn textures to be delivered to audiences faster and more widely through efficient technology.

## **4. The Core Contradiction and Solution Path of the Integration of Traditional Hand Drawing and 3D Virtual Reality**

### **4.1. Visual Logic Conflict between Two Dimensional Plane and Three Dimensional Space**

In traditional hand painting, the artist spreads the world on paper solely through perspective: focal perspective allows the line of sight to follow the protagonist, while scattered perspective can capture distant mountains and nearby waters in one frame. The lines and colors are arranged along the texture of the paper, and the audience's gaze naturally falls on the place they should be looking at. 3D virtual reality does not follow this rule - it uses computer algorithms to build a three-dimensional model, adjust materials, calculate light and shadow, and allows the audience to rotate around the scene, as if reaching out to touch the shoulders of characters. The awkwardness between the two lies in the details: hand drawn characters move with exaggerated dynamic lines, and light and shadow are only painted in simple directions with a few strokes; Three dimensional characters have to calculate how their bones rotate, how their muscles stretch, and how light and shadow follow the laws of light reflection. To solve this situation, "stylized rendering" is a good skill. Like in "Fantasy Water Margin," the character uses "2D brushstrokes to create 3D models." As soon as the muscles of the character turn, the shadows of the lines spread out, as if the artist added a touch of pen on the spot. This not only retains the three-dimensional sense, but also preserves the rhythm of the hand drawn lines, blending the flat art with the three-dimensional reality [4].

### **4.2. The Creative Tension Between Artistic Subjectivity and Technological Standardization**

The most touching aspect of hand drawing is the "difference" in the artist's pen: when drawing a girl, some people use thin lines to highlight her elegance, while others use dark colors to blend

out her cuteness, each with their own aesthetic and emotional preferences. 3D technology is about the "standard answer" - modeling requires counting the number of faces, and light and shadow must be calculated according to optical formulas. There cannot be any difference in one step, no more than one point or less. To reconcile the two, "artistic parameterization" is a good way: turning the thickness, color transparency, and texture particles in hand drawn lines into adjustable numerical parameters. The animator pulls a slider, and the lines can change from pencil thin to charcoal rough; By adjusting the transparency, the blending sensation of watercolor will be revealed from the screen. Not only did it not bind the hands of the artists, allowing them to create according to their hearts, but it also improved efficiency by using technical standards, allowing 3D animations with hand drawn warmth to be mass-produced, bringing together the "vitality" of art and the "accuracy" of technology.

## 5. Concrete Manifestations of Animation Visual Innovation from the Perspective of Fusion

Fusion technology allows animated characters to break free from flat frames, with both hand drawn lines and a three-dimensional spatial hierarchy. Just like the characters in "Fantasy Westward Journey Animation - Time Space Gap", the artist first outlines the characters on paper, sets the color tone, and then uses 3D software to wrap the characters with Xuan paper textured skin, leaving hand drawn unique turning lines at the joints - when the characters turn around, those lines naturally blend out along the movement, like the artist adding a pen on the spot, not losing the classic appearance of the game IP, but also adapting to the multi angle viewing needs in VR scenes. Whether you look at the character's demeanor from the front or the wrinkles on the clothes from the side, you can feel the warmth of hand painting and the three-dimensional reality, as if you have lifted the character from paper into a three-dimensional world [5].

The changes in the scene are even more surprising. Previously, hand drawn backgrounds were just static 'canvases', but now they have become immersive spaces that can be penetrated. For example, in the VR scene style of "The Secret of the Kael Sutra", the designer first scans the Celtic patterns and watercolor textures in the hand drawn manuscript into the computer, and then uses 3D modeling to paste them onto the walls and domes of the virtual building. The audience walked in and could touch the patterns, as if they were real hand drawn drafts; Waving your hand can also make the patterns change color with the light, turning decorations that were originally only in the painting into interactive parts. Standing in the virtual monastery, watching the flowing patterns in the light and shadow, it feels like stepping into a mysterious world in a movie, even slowing down one's breathing.

In terms of action design, this fusion has also played a new role. Hand drawn, first determine the exaggerated posture vertices of the character's jumping - such as the curvature of the body when jumping, the strength of the arm extension, full of hand drawn agility; Leave the middle movement to the 3D dynamics engine, calculate the body's inertia accurately, and prevent the movement from drifting; Finally, add a hand drawn speed line and follow the trajectory to disperse. Jumping up like this not only has the exaggerated vitality of hand drawing, but also conforms to the real physical sense. The audience can feel the momentum when watching the character jump up, which is more powerful than pure hand drawing or 3D.

## 6. Practical Case Analysis: Taking the Animation of "Sand Lantern" and "Fantasy Water Margin" as Examples

### 6.1. "The Sand Lamp": The Coexistence of Hand Drawn Texture and VR Frameless Narrative

The Japanese short VR animation "Sand Lamp" has created a truly ingenious fusion of hand drawing and VR. The entire film only used 3D fluid simulation in the opening yellow sand scene - making the wind and sand fly real, while the other characters and props were all hand drawn original drafts: the production team carefully scanned the drafts and then built them up in three-dimensional space, with 4K high-definition filling in the details. Even the fine marks of pencil strokes on paper and the blurred edges of ink wash were clearly visible in VR devices. The audience puts on the device, as if leaning in front of the artist's drawing plan, and can feel the weight of the strokes, which is a delicacy that traditional animation cannot provide. What's even better is the "frameless" feeling of VR - hand drawn scenes are not framed by the screen, but spread along the field of view to the corner of the eye. The audience turns their heads and can see 360 degrees, coupled with Dolby Atmos: the wind changes direction with the direction of the head rotation, and the footsteps get closer and farther, as if they are really standing in an animation. You don't have to passively watch the screen, you can find the character's small movements and hidden details in the scene by yourself. This immersive experience breaks down the traditional viewing mode and allows the audience to get closer to the hand drawn world [6]. The Sand Lamp combines hand drawn details with VR immersion, allowing the audience to witness the immense power of the two technologies.

### 6.2. "Fantasy Water Margin" Animation: Cross Media Style Transformation of Game IP

The animation of "Fantasy Water Margin" aims to solve the problem of the game's old IP - old players are accustomed to 2D hand drawing, but 3D cutscenes always disrupt the art style. The production team came up with a clever trick: "3D cartoon rendering+hand drawn stroke enhancement". First, let the actors wear sensor suits to perform the fight, extract the motion data, and turn it into the "skeleton movements" of the 3D characters, making the fight smooth and realistic; Let the Shader program act as an "electronic paintbrush" to draw bold lines and lay out colors on the 3D model, breaking free from the flavor of the game's original artwork. The "dot matrix special effects" in the game - the flickering light during magic attacks - are recognizable by veteran players at a glance, evoking memories of youth [7]. This integration allows veteran players to watch animations: they not only see the smooth combat brought by 3D, but also feel the familiar hand drawn texture; New audiences are also drawn in by this unique art style. Fantasy Outlaws of the Marsh did not go for nothing, but paved the way for the game's IP to be adapted into animation and showcased the ability of hand drawn and 3D animation to blend across different media.

## 7. Conclusion

Ultimately, the integration of traditional hand drawing and 3D VR is a self rejuvenation of animation art in the digital wave. It is never a simple patchwork of technology, but rather a dismantling and re weaving of the languages of two media, giving visual experience a different way of life - jumping out of the plane into three dimensions, from one-way viewing to interactive, from monotonous production to expression with the imprint of the creator. Translate the lines, colors, and textures in hand drawn art using digital technology; Adding an artistic touch to the construction of three-dimensional space and real-time interaction, animation not only carries the humanistic warmth of hand drawing, but also adds new



immersive experiences. In the future, technologies such as 5G, motion capture, and haptic feedback will continue to advance, and the integration of the two will go even deeper: hand drawing may not only be for viewing - with pressure sensing brushes and gloves that can simulate temperature, viewers may be able to "touch" the thickness of strokes and the temperature of paint during interaction; 3D VR will also better understand the artistic conception of traditional art - using physics engines to simulate the randomness of watercolor blending, and using spatial audio to reproduce the sound of paper and pen when the artist is drawing. The trend of "technology moving into art, art using technology to live" will open countless doors for visual innovation in animation, pushing animation from a "medium that only uses the eyes" to a "medium that can mobilize all senses". This is a different journey. Each section of this article is based on publicly available industry reports, technical literature, and real-life animation cases; The data can be found in professional journals such as "Film and Television Technology" and "Animation Research", as well as public information from the International Animation Federation (ASIFA), in order to reveal the real situation.

## References

- [1] Young M. Drawn to 360°: How can the aesthetics and qualities of traditional 2D animation storytelling add to the immersive VR projection paradigm?[[J]]. *Animation Practice, Process & Production*, 2018, 7(1): 11-40.
- [2] Lasseter J. Principles of traditional animation applied to 3D computer animation[M]//*Seminal graphics: pioneering efforts that shaped the field*. 1998: 263-272.
- [3] Yang L I, Huang J, Feng T, et al. Gesture interaction in virtual reality[[J]]. *Virtual Reality & Intelligent Hardware*, 2019, 1(1): 84-112.
- [4] Chen Qian A Study on the Visual Representation and Function of Two dimensional and Three dimensional Animation Films [D]. Shaanxi University of Science and Technology, 2015.
- [5] Kivistö J. Hybrid animation: The process and methods of implementing 2D style in 3D animation[[J]]. 2019.
- [6] Giusto G M. From script to screen: Connecting creatives in 360° virtual reality filmmaking[M]. Drexel University, 2020.
- [7] Power P. Animated expressions: Expressive style in 3D computer graphic narrative animation[[J]]. *Animation*, 2009, 4(2): 107-129.