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Contour Lines: Role of traditional chinese ink painting techniques in 3D animation aesthetics

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Abstract

This article aims to study the presentation effect and function of lines in the production process of 3D ink animation. Most works mainly use 3D effects and material mapping to simulate the ink style, making the contour lines in the 3D space present a two-dimensional posture and pursuing the simulation of nature in traditional ink paintings. Finally, it explores how to better integrate the aesthetics of lines in traditional Chinese painting into the production of 3D animation in the development process of 3D Chinese-style ink animation and conducts an in-depth analysis of its application.

Keywords: 3D Animation, Ink Style, Space, Contour Lines

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1.0 Introduction

3D ink animation is an innovative form that combines traditional Chinese ink painting elements with modern 3D animation technology. It combines the artistic elements of traditional Chinese ink painting with modern 3D animation technology, making the picture not only have the charm and temperament of conventional ink painting but also be able to use 3D technology to present more vivid and rich picture effects. Incorporating traditional art forms into contemporary digital practices has become an area of increasing interest in the fields of visual arts and animation. Among these art forms, traditional Chinese ink painting, characterized by its unique contour lines and expressive brushwork, has rich visual and aesthetic qualities that are of great significance to modern 3D animation. However, the potential of these traditional techniques in enriching the aesthetics of 3D animation remains underexplored. This study addresses this gap by examining how contour lines in traditional Chinese ink paintings can enhance the visual narrative and emotional depth of 3D animation works.

Recent statistics reveal that the animation industry is increasingly moving towards integrating multicultural aesthetics. Over the past five years, Chinese animated films have shown a growing trend towards 3D Computer-generated imagery animation while preserving the significance of 2D hand-drawn animation. These films frequently integrate cultural aspects and exhibit distinctive visual styles, reflecting the ingenuity and cultural identity inherent in Chinese animation. Nevertheless, despite excelling in areas like story creation and scene design, Chinese animation continues to predominantly focus on 3D CGI and 2D hand-drawn techniques. According to the

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Animation Association (2023), approximately 40% of new animated films incorporate elements of traditional art forms. Despite this trend, academic research that explicitly links traditional Chinese ink painting techniques to 3D animation aesthetics is scarce. Existing literature, such as that by Zhang (2021) and Liu (2022), focused primarily on the technical aspects of animation and the incorporation of digital tools while ignoring the profound influence of traditional artistic principles on animation aesthetics. Hence, this is a major research gap that this study aims to fill.

The primary objectives of this study are to identify the aesthetic characteristics and cultural significance of contour lines in traditional Chinese ink painting, emphasizing their role in conveying depth, movement, and emotion. And the study aims to analyze how these traditional contour techniques can be adapted and applied within the framework of modern 3D animation, exploring the technical and creative processes involved. Finally, it examines the extent to which integrating these traditional elements enhances the emotional depth and visual narrative of 3D animated works, offering insights into how cultural heritage can inform and enrich contemporary digital art forms.

2.0 Literature Review

2.1 Analyze the Contour Techniques in Traditional Chinese Ink Painting and Their Historical Significance

In recent years, scholars have conducted a deeper exploration of the contour techniques in traditional Chinese ink painting. Chen Hongyi (2025) pointed out that ink painting is not only an art form but also a cultural gene that can convey the inner emotions of the Chinese people. Traditional Chinese ink painting has a long history spanning thousands of years. One of the main characteristics of this art form is the use of contours, which are not only the outline of the subject but also a tool to convey depth, texture, and movement. Weng (2019) argued that the contours in Chinese ink painting are fluid and expressive, allowing artists to depict physical forms and emotional resonances.

In addition, the research of Wang Wenyu and Hassan Alli (2024) emphasized the importance of traditional ink painting in visual communication design. Contours serve as a bridge between visual art and philosophical foundations, especially Taoist principles, where balance and harmony are of paramount importance (Chen, 2021). This philosophical background enriches our understanding of contours as not only a technical tool but also a means to convey a deeper narrative in an artwork, which can provide insights into contemporary applications of 3D animation aesthetics.

2.2 Explore the Application of Traditional Chinese Ink Painting Techniques in 3D Animation

The application of traditional Chinese ink painting techniques in 3D animation provides a unique opportunity to combine historical art with contemporary digital practices. Wu (2022) argued that incorporating traditional art forms into animation can explore new aesthetic dimensions and narrative styles. In his study, he suggested how animators can use the spontaneous brushstrokes and soft edges characteristic of ink painting to create a visual language that resonates with cultural heritage while appealing to modern audiences.

In addition, the work of Li and Wang (2023) examined how the fluidity of ink lines can be digitally replicated using software tools such as Adobe Animate and Blender, effectively translating traditional aesthetics into three-dimensional space. Their study suggested that combining these techniques can enhance the artistic depth of animation and enrich audience engagement as it evokes a sense of nostalgia and cultural appreciation. However, despite its promise, this area remains underexplored, and further research is required on how specific elements of Chinese ink painting can be more systematically incorporated into 3D animation production.

2.3 Evaluate the impact of incorporating traditional aesthetics in animation works on audience perception and emotional engagement

The psychological impact of visual aesthetics on audience engagement has been a research topic in various fields of art and media. Zhou (2021) showed that animations rooted in traditional aesthetics elicit stronger emotional responses, especially when using familiar cultural symbols and techniques such as contour lines. His empirical research revealed that audiences showed higher levels of emotional engagement and cognitive reflection when watching animations that incorporated elements of traditional Chinese ink painting.

In addition, the qualitative analysis conducted by Tan and Liu (2023) emphasized that audiences often feel a sense of cultural resonance and identification when faced with artworks that incorporate their cultural heritage. This suggests that contour lines, as a traditional artistic technique, can not only enrich the visual composition of animations but also promote a deeper connection between artworks and audiences.

3.0 Methodology

3.1 Research Design

This study adopted a qualitative research method to explore the role of contour lines in traditional Chinese ink painting techniques in 3D animation aesthetics. Qualitative research is particularly suited for exploring subjective experiences and perceptions in artistic and cultural contexts (Creswell & Poth, 2018). The study used a phenomenological approach, which allows for in-depth understanding of the lived experiences of animators, artists, and scholars regarding this form of artistic fusion (Moustakas, 1994).

This study used purposive sampling, and the participants will include 3D animators, artists, and scholars. The research plans to recruit 20 participants to ensure a diverse perspective and achieve thematic saturation. Data will be collected through in-depth interviews using a semi-structured interview method to allow participants to freely share their experiences and opinions.

Table 1: Interview Results

Viewpoint	Column A (*t*)
1. Enhances visual depth and layering	8
2. Foster's cultural integration and innovation	5
3. Strengthens artistic expression and emotional depth	4
4. Presents challenges in translating traditional techniques into digital art	2
5. Increases audience cultural awareness and interest	1

(Source: The data were compiled by the author Xu Chao)

Out of 20 people, a majority (40%) felt that outlines significantly enhance the visual depth and layering of 3D animation aesthetics. The second most supported view (25%) involves promoting cultural integration and innovation, indicating recognition of the potential of traditional technologies to positively influence modern aesthetics. A small minority (20%) valued the role of contour lines in enhancing artistic expression and emotional depth, emphasizing the emotional connection of artistic creation. Only 10% of participants highlighted the challenges of converting legacy technologies into digital formats, suggesting that while challenges exist, they may not be as prominent in people's minds. Only 5% believed that the practice increased cultural awareness and interest among viewers, which may indicate a gap in the impact of these artistic techniques on broader cultural perceptions.

The overwhelming support for enhanced visual depth suggests that artists and animators consider contouring a key element in creating immersive and layered visual effects in 3D animation. The relatively low support for cultural awareness suggests that while many recognize the aesthetic contributions of traditional techniques, few connect these techniques to a wider cultural conversation or awareness, perhaps reflecting the need for greater public awareness of the importance of these integrations. The responses indicate a general agreement on the positive role of contouring but also point to the challenges of integrating traditional methods into modern digital media.

3.2 Literature research method

The literature research method reveals the importance of contour lines in artistic expression by analyzing relevant literature. According to Zhang (2020), contour lines are the basic elements for defining shapes and edges. Through different changes in lines, they can convey the volume and depth of objects. In addition, Li (2019) pointed out that traditional Chinese ink paintings often use contour lines to depict the forms of nature while paying attention to the fluidity and emotional expression of lines. This technique not only enhances the layering of the picture but also provides viewers with a rich visual experience.

In further research, Chen (2021) emphasized the aesthetic principles in 3D animation, pointing out that in this field, the application of contour lines is not limited to the depiction of objects but also lies in conveying emotions and stories through the use of lines. This aesthetic integration not only enriches the visual effects of 3D animation but also enables the audience to better appreciate the depth of culture.

3.3 Example method

Combined with the theoretical basis of the above literature, this paper takes specific cases as the basis of the example method to explain the practical application of contour lines in 3D animation. Taking "Big Fish and Begonia" as an example, this animation incorporates traditional ink techniques in visual presentation. The characters and scenes in the animation are designed with delicate contour lines, creating a visual effect that is both real and dreamy. The contour lines not only add a sense of three-dimensionality to the characters but also make the characters more vivid through the agility of the lines, enhancing the immersion of the story.

Another typical case is "When the Wind Rises on the Willow Branches," which successfully realizes the unique style of Chinese ink painting in 3D space by using the traditional techniques of ink painting. The optimized contour lines make each scene and character full of cultural charm and convey a strong emotional atmosphere. When appreciating the animation, the audience not only experiences the visual impact brought by modern technology but also feels the profound heritage of traditional Chinese art.

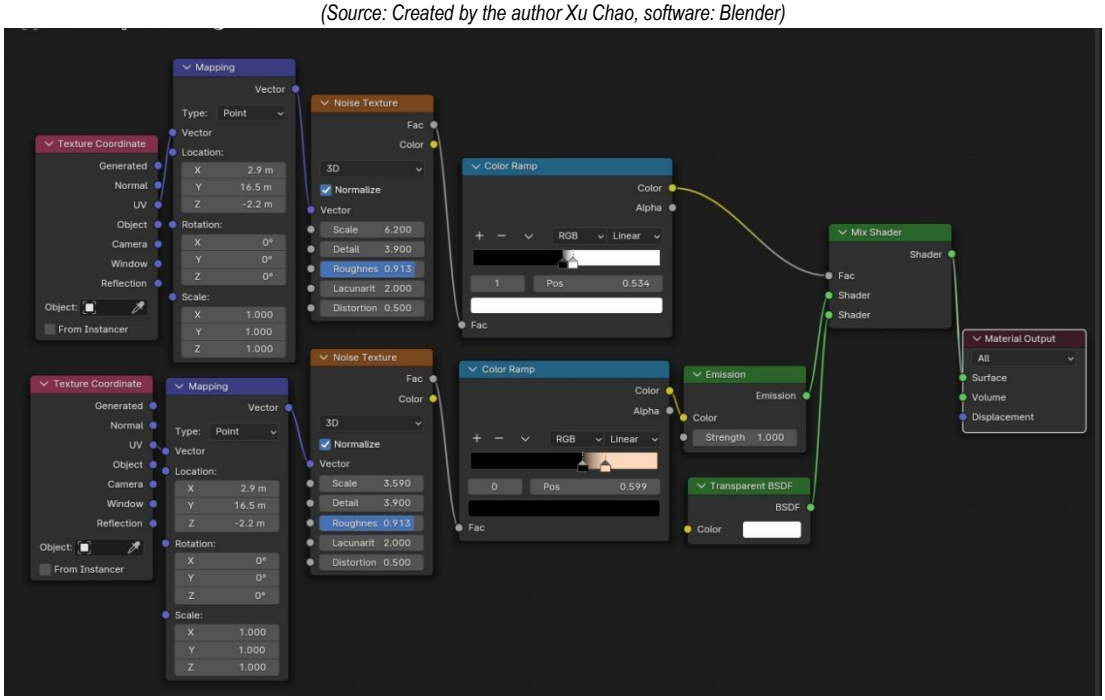
3.4 Practical Research

Taking the 3D ink animation made in Blender as an example, traditional Chinese ink art has become an important source of inspiration for modern animation creation with its unique expression techniques and profound cultural connotations. In modern 3D animation software such as Blender, the creation combined with the ink style can not only show visual beauty but also convey rich cultural connotations. The lines in ink paintings are usually smooth and natural. In Blender, delicate models and materials are needed to imitate these line effects. Use Blender's node editor to create materials in the style of ink paintings. Procedural textures (such as noise and moire) can be used to simulate the random and gradient effects of ink.

In this practical component, procedural materials and shaders are constructed to replicate the soft, flowing lines of traditional ink paintings. Blender’s node editor is utilized to simulate brush textures, noise gradients, and moiré effects. Similar techniques have

been explored in other digital ink painting projects (ACM SIGGRAPH, 2024), showing that digital tools can successfully replicate the organic feel of traditional media.

Picture 1: Blender 3D Chinese ink animation
(Source: Created by the author Xu Chao, software: Blender)



Picture 2: Blender 3D Chinese ink animation Material
(Source: Created by the author Xu Chao, software: Blender)

4.0 Findings

4.1 The symbolism and expressiveness of contour lines

Participants generally believe contour lines are an important bridge between traditional ink painting and modern 3D animation. Contour lines in ink painting not only define shapes but also convey emotions and artistic conception. In 3D animation, artists enhance the emotional expression of characters through changes in the thickness and straightness of lines. For example, some artists mentioned that through delicate contour lines, the softness and delicacy of the characters can be conveyed, while rough lines can express strength and conflict.

4.2 Cross-cultural integration and innovation

Through the application of ink painting techniques, participants showed that 3D animation can not only illustrate the aesthetics of traditional culture but also promote cross-border integration of cultures. Artists discussed how to combine traditional Eastern art forms with Western animation techniques to form a unique visual language and narrative style through the use of contour lines. For example, one artist mentioned that his work used the contour line technique in the style of ink painting, which successfully attracted international audiences and triggered a deep dialogue between tradition and modernity.

4.3 Visual hierarchy and sense of space

The study showed that contour lines can help enhance visual hierarchy and sense of space in 3D animation. Participants emphasized that by using contour lines, foreground and background can be effectively distinguished, creating a more layered picture effect. For example, in a 3D animation using traditional ink painting style, the use of contour lines makes the relationship between the character and the environment clearer, thereby enhancing the audience's sense of immersion.

5.0 Discussion

Contour lines, as essential elements in visual art, hold strong expressive potential. In traditional Chinese ink painting, artists manipulate line thickness, rhythm, and fluidity to convey emotions and artistic intent, as supported by Li (2019), who emphasized that line variation in ink art is a primary means of emotional transmission. This study confirms and extends Li’ s findings by demonstrating how such expressiveness can be effectively adapted into 3D animation, where, for instance, soft contour lines express gentleness, and jagged lines communicate tension. This technique deepens the audience's emotional engagement, aligning with Chen's (2021) claim that visual language in animation plays a crucial role in emotional storytelling.

Moreover, the integration of traditional contour aesthetics into 3D animation not only enhances visual depth but also enriches cultural connotation. Previous scholars, such as Zhang (2020), have discussed how line-based expression in Chinese ink painting supports both compositional structure and thematic depth. However, few have directly explored how this visual grammar can be reinterpreted in digital and immersive media. This study fills that gap by analyzing how 3D ink-style animation creates a layered spatial experience through the nuanced application of contours, as also evidenced by the animation “Big Fish and Begonia.” Such findings align with Wang and Alli (2024), who highlighted the potential for traditional art to create new narrative modalities in CG animation.

The application of contour lines, a traditional form of expression in ink painting, in 3D animation has achieved a cross-border integration of cultures. This integration not only creates a new expressive language for animation but also promotes dialogue between different cultures. Participants mentioned in the discussion that by combining traditional Chinese art with modern technology, artists can create works with global appeal. This unique visual style not only sparks interest in traditional culture but also enhances the audience's cultural identity, especially among the younger generation, who are more likely to accept and appreciate this innovative form.

Digital technology greatly shortens the time needed to make an ink animation, not only improving work efficiency but also solving the complicated problems of traditional production techniques and creating conditions for the reproduction of ink animation. The research on the audio-visual language features and film and television aesthetic features of traditional ink animation can provide theoretical guidance for the creation of 3D ink animation, which has a certain reference value.

6.0 Conclusion & Recommendations

This study underscores the essential role of contours in 3D animation, demonstrating their ability not only to define characters and scenes but also to convey a sense of shape, volume, and spatial depth. By effectively utilizing contours, creators can evoke distinct visual emotions and artistic styles, thereby enhancing the immersive experience for viewers. The integration of traditional Chinese ink painting techniques with modern animation enriches the cultural and aesthetic dimensions of 3D works, offering a unique fusion of classical art and contemporary technology.

From a theoretical standpoint, the research broadens our understanding of the role of contours in visual arts, particularly within modern animation. It introduces a fresh theoretical framework that combines traditional artistic insights with cutting-edge animation technology, contributing to the study of cross-disciplinary art integration and expanding the boundaries of aesthetic inquiry.

On a practical level, the findings offer valuable guidance for animation creators, suggesting that incorporating traditional art forms can enhance both the cultural richness and the visual appeal of their work. In an increasingly globalized market, these elements can help animations stand out and attract a wider, more diverse audience.

However, the study does have its limitations. It primarily examines a small selection of representative works, which may not fully capture the varied use of contours across the broader animation landscape. Additionally, the impact of contour lines may differ depending on cultural contexts and audience preferences.

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Paper Contribution to Related Field of Study

3D animation design, game design, advertising, fine arts, computer science, cultural studies, and other disciplines

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