On the Application of 3D Digital Technology in Radio and Television: Postprint

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Abstract

With the development of new digital media, the production of radio and television programs has entered a new era. In this context, the advancement of 3D modeling and simulation technology has greatly enriched human imagination while enhancing the efficiency and flexibility of content creation. The effective application of 3D digital technology in the field of radio and television has truly achieved the organic integration of science and art, delivering diverse visual experiences to audiences through an entirely new form of presentation. This paper will attempt to briefly analyze the concept of 3D digital technology in the field of radio and television, and specifically examine its functions and value based on its current status within the industry.

Full Text

A Brief Discussion on the Application of 3D Digital Technology in Radio and Television

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Abstract: With the development of new digital media, the production of radio and television programs has entered a new era. In particular, advances in 3D simulation and modeling technologies have greatly enriched human imagination while improving the efficiency and flexibility of content creation. The effective application of 3D digital technology in radio and television has truly achieved an organic integration of science and art, delivering diverse visual experiences to audiences through an entirely new form of presentation. This paper attempts to analyze the concept of 3D digital technology in the field of radio and television, and to examine its functions and value within the industry based on its current state of development.

Keywords: 3D digital technology; radio and television; visual art forms; authenticity; appeal

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1. The Current State of 3D Digital Technology in Radio and Television

3D digital technology did not garner immediate attention upon its inception; rather, it has gradually matured through continuous refinement by developers, producing 3D animation works that audiences now widely enjoy, which have subsequently been integrated into radio and television programming. Here, we briefly trace the key milestones in the development of 3D animation works to illuminate how technological innovation has influenced visual art forms.

The world' s first 3D animated short film, *Tin Toy*, produced by Pixar Animation Studios, entered public view in 1989 with an Oscar for Best Animated Short Film. However, constrained by the nascent stage of computer 3D graphics technology, modeling and rendering functions suffered numerous limitations, and animation production generally continued to rely on traditional filming equipment. This resulted in sluggish development of 3D animation for several years. It was not until 1995, when Pixar produced *Toy Story*—hailed as the world' s first fully computer-animated feature film—that the industry gained a foundation, thanks to its considerable economic returns and sensational social impact. This landmark achievement also established the distinctive stylistic realism that characterizes 3D animation. From this point forward, Pixar' s exceptional contributions to 3D graphics and computer-generated imagery (CGI) substantially advanced the shaping of visual narratives through 3D digital technology, creating a visual art form that simulates real environments while superimposing special effects. In subsequent years, increasing numbers of television commercials and radio and television programs adopted such technologies, incorporating numerous 3D visual elements that enriched both content and form while driving industry transformation and innovation from a technical perspective.

French scholar Jean Baudrillard posited that 3D digital technology offers a visual experience in which the distinction between real and false becomes difficult to discern, placing it within the research domain of visual narrative and visual culture. As a mainstream platform with a solid mass base and well-established production teams, radio and television' s active exploration of new digital media and close attention to visual art forms have promoted an audience-centered communication philosophy. Therefore, 3D digital technology empowers radio and television not merely to improve ratings, but more importantly to evoke immersive sensory stimulation and spiritual pleasure in viewers, ultimately leading

to recognition of the program' s underlying values.

As we enter the 5G era, a vast number of digital virtual works have already integrated into our daily lives, with 3D digital technology continuously being applied across various industries. Particularly under the current trend of media convergence, 3D digital technology plays a pivotal role in driving reform within the radio and television sector. With the continuous expansion of new media platforms, traditional radio and television media no longer hold absolute advantages, and their programs exhibit clear shortcomings in terms of visual communication power, information volume, and audience interactive experience. Faced with tremendous impact and survival pressure, the effective application of 3D digital technology can update presentation methods, optimize content allocation, and thereby enhance the overall service quality of radio and television programs, stimulating platform value and broadening market potential.

Moreover, the application modes of 3D digital technology in radio and television are remarkably diversified. More precisely, the technology exists in harmony with program concepts and overall styles. As evidenced by its flexible and varied penetration across different program types—including news, variety shows, talent competitions, drama series, and Spring Festival Galas—we can observe this versatility. Based on such variability, we attempt to systematically categorize current application modes of 3D digital technology, drawing upon visual culture research theories and analyzing representative radio and television cases to summarize their characteristics. The following discussion proceeds from three perspectives:

1.1 Aesthetic Perspective

With the popularization of digital scene simulation technology, imagery can increasingly deceive audiences visually, and information value is sometimes deliberately manipulated or even falsified. The communication environment contains no shortage of 3D visual works created merely to attract attention with poor taste. In this context, as mainstream media, radio and television consistently focus on cultivating audience aesthetic consciousness, particularly considering younger viewers with immature minds, and exercise strict quality control over broadcast content. While virtual imagery is essentially a form of creative production of the real world, its application must not only comply with ethical norms but also respond to what Mr. Zong Baihua advocated as an "artistic outlook on life" —in other words, it should possess keen insight into beautiful things. Regarding how to define beauty, compared with the simple notion of "looking good," whether visual art works can evoke emotional identification from audiences has become an important reference standard.

1.2 Sensory Experience

The virtual reality (VR) and augmented reality (AR) sectors of 3D digital technology are permeating people' s daily lives with unstoppable momentum. Al-

though current R&D has not yet achieved the seamless integration of virtual and reality depicted in the science fiction film *Ready Player One*, the reshaping of human sensory experience by immersive technology is traceable. For instance, Storm TV launched what it claimed to be the world' s first VR television in 2016, which, when paired with corresponding wearable products, can provide a 720° panoramic viewing experience. Through systematic intervention in visual, auditory, and tactile senses, this product makes users themselves feel like part of the media, immersed in the virtual dimension of film and television works. However, reviews of such products have been mixed, suggesting that VR technology may require further improvement to create sensory effects that meet popular expectations.

VR, AR, and naked-eye 3D holographic projection technologies have been widely applied in radio and television. The CCTV Spring Festival Gala has repeatedly combined 3D virtual imagery with live stages. In Li Yuchun' s 2015 solo performance "Shu Embroidery," holographic technology using transparent medium screens enabled the singer to interact with virtual characters appearing in mid-air. The 2019 song and dance programs "Dunhuang Flying Apsaras"and "Spring Sea" featured lotus flowers and silk ribbons faintly visible through swirling mist, rotating lanterns, and brilliant seas of flowers—all real-time AR overlays on live performances. Thus, even for live programs without post-production, 3D digital technology can still achieve novel and aesthetically pleasing audio-visual effects that trigger sensory stimulation and spiritual pleasure in viewers.

Additionally, opening animations for numerous variety shows such as *Keep Running!*, *Dad, Where Are We Going?*, and *Star Detective* have all utilized the popular Cinema 4D scene rendering software. Its cartoon style and interesting special effects perfectly match the reality show themes and effectively render the relaxed and cheerful atmosphere of variety programs. This demonstrates that the application of 3D digital technology comprehensively considers audience experience needs rather than simply seeking to attract attention.

1.3 Humanistic Care

In the virtual archaeology pioneered by Paul Reilly, researchers initially used 3D digital technology to simulate and describe architectural ruins, primarily to assist professionals in restoring historical truth from fragmented information. However, as the technology has developed, we can observe its continuation in historical documentaries and educational films. For example, the documentary *Old Summer Palace*, released in September 2006, used 3D special effects to recreate the splendor of the former "Garden of Gardens," while the documentary *The Rise of Great Powers*, released in November 2006, also employed 3D technology to restore numerous important historical scenes, including the Portuguese and Spanish voyages of exploration, the Dutch merchant fleet, the storming of the Bastille during the French Revolution, and the arrival of the Mayflower in America.

In recent years, a large number of cultural variety shows have also adopted 3D technology for content and format innovation. In the third season of the cultural exploration program *National Treasure*, the segment on the Qinling bronze chariots featured an impressive video introduction derived from 3D simulation principles. In the digital context, bronze artifacts thousands of years old come alive, with various complex and delicate components that can be freely disassembled and displayed panoramically to audiences, making history no longer sealed in museums or frozen in books. The effective application of 3D digital technology not only enriches audience imagination but also brings audiences "closer" to history, breaking through the limitations of time and space through technology. The program practices the core concept of creative transformation and innovative development of Chinese traditional culture, which reflects from another angle that radio and television, as important components of people' s daily lives, consistently uphold humanistic care, pay attention to the development issues of human society, and aim to convey correct values while constructing a beautiful life and poetic dwelling.

In the 2019 costume suspense drama series *The Longest Day in Chang' an*, the director used 3D digital technology to construct and render a prosperous Tang Dynasty scene. The 3D technology in the series even surpassed acting and plot factors to become a hot topic among audiences, with the breathtaking giant lantern tower undoubtedly serving as a focal point. The visual effects of the lantern tower were not fabricated out of thin air but were the product of appropriate artistic processing based on historical documents about the Tang Dynasty' s Shangyuan Lantern Festival. This represents the best embodiment of media workers discovering and shaping beauty from the context of Chinese traditional culture. Today, under the influence of dominant Western culture, Chinese traditional aesthetics show signs of decline. Excellent works such as *The Longest Day in Chang' an*, from an aesthetic perspective, integrate advanced 3D digital technology to reintroduce beautiful things sealed in history into public view, stimulating emotional identification with traditional festival customs among audiences.

2. Analysis of the Role of 3D Digital Technology in Radio and Television

2.1 Authenticity Based on the Objective World

As the consumption level of the general public continues to rise, consumer demands and aesthetics are also constantly improving. Compared with print media such as books and newspapers, people are more willing to accept radio and television transmission methods with stronger visual impact. This is largely because radio and television accompany consumers throughout their growth, and with the popularization of 3D digital technology, a large number of works integrating such technology have emerged in recent years. Their realistic presentation differs from traditional two-dimensional television works, emphasizing

three-dimensionality and diversified forms to present viewers with lifelike visual effects and immersive experiences that deliver visual impact and enhance the artistic atmosphere of the entire advertising work. This also aligns with the foothold of television advertising communication being based on "real life."

In traditional actual film and television shooting, numerous real-world factors such as shooting objects, climate conditions, costs, and locations often prevented creative content from achieving optimal results. However, with the intervention of 3D digital technology in radio and television in recent years, filming is no longer limited by physical conditions, providing designers with greater creative initiative and space for artistic processing. A large number of radio and television works have broken free from the past constraint of having to shoot on location, requiring only the design of corresponding stage backgrounds in studios, after which post-production effects for art design, scenery, and lighting can complete the work. This not only effectively reduces labor costs but also improves the feasibility of spatial special effects in radio and television planning. Many such creative approaches currently exist in the market.

For example, in the second post-pandemic episode of Hunan TV' s variety show *Day Day Up* titled "Reality Show Exploring Mysterious Yunnan," the program invited the AR virtual idol Xing Tong to participate as an official guest for the first time, who performed the dazzling dance "Spirit of the Peacock" with artist Zhang Zixuan. Xing Tong' s participation as an AR virtual idol in this episode held significant meaning, demonstrating not only that 3D digital technology has gained recognition from traditional radio and television industries but also that it can bring more possibilities to artistic creation. Indeed, many similar cases combining virtual idols have emerged in recent years, such as the 2019 Bilibili Macro Link (BML) offline event, which showcased the strongest domestic lineup of virtual idol concerts. By combining offline activities with live online broadcasting, they presented an entirely new form of concert that effectively demonstrated the advantages of 3D digital technology in spatial special effects.

2.2 Effectively Enhancing Artistic Appeal of Works

Television advertising serves as a primary means for consumers to learn about products, and some excellent advertising works can even provide viewers with visual enjoyment. The intervention of 3D digital technology can enrich content and diversity while effectively improving the artistic appeal of works. Designers living in this era can be considered fortunate, as the optimization of 3D digital technology has granted them a certain degree of technical initiative. Compared with the objective world' s existence, they emphasize the "creativity" of the work itself, allowing more room for unconstrained imagination during the creative process. This initiative addresses to some extent the rigid and inflexible limitations of traditional advertising, resulting in a large number of highly creative radio and television works in recent years that have brought viewers one visual feast after another.

For instance, the public service advertisement *Believe in the Power of Brands—Ink Animation Edition* broke through the limitations of traditional promotional videos by combining 3D digital technology with traditional Chinese ink painting to create a radio and television work with national characteristics. This Chinese-style promotional video won the Gold Award at the 2010 New York Festivals Advertising Awards and the Best Image Promotional Video Gold Award at Singapore' s Promaxbda Asia. Since then, this creative approach has continued to influence the direction of domestic radio and television production, as seen in the 2019 *Impression of Zhejiang* ink promotional video, which employed similar techniques combined with cutting-edge 3D software such as Cinema 4D and Adobe After Effects. In the era of rapidly developing digital media, 3D digital technology has become an indispensable element in radio and television. Rather than focusing solely on surface style and technology, we should emphasize innovative thinking while rooting ourselves in local culture and national art to create film and television works with distinctive national characteristics.

2.3 Advantages in Spatial Special Effects

In traditional film and television shooting, numerous real-world factors—including shooting objects, climate conditions, costs, and locations—often constrained production. However, 3D digital technology has overcome these limitations, providing designers with greater creative initiative and space for artistic processing. A large number of radio and television works have been liberated from the necessity of location shooting, requiring only the design of corresponding stage backgrounds in studios, after which post-production effects for art design, scenery, and lighting can complete the work. This approach not only effectively reduces labor costs but also enhances the feasibility of spatial special effects in radio and television planning, with many such creative methods currently available in the market.

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Note: Figure translations are in progress. See original paper for figures.