# Application of Multimedia Technology in Television Art Galas: Postprint

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## Abstract

With the continuous advancement of science and technology, traditional television media has faced tremendous impact. To cope with intense market competition, the transformation and development of television media has become an inevitable trend. In recent years, numerous stage works employing multimedia technology have emerged in television art galas, representing a significant manifestation of this transformation. Simultaneously, through effective utilization of multimedia technology, a completely refreshed visual experience can be delivered to the general audience. Based on this, this paper first introduces multimedia technologies commonly used in television art galas, secondly analyzes the role of multimedia technology in television art galas, and finally discusses the application of multimedia technology in television art galas using virtual reality technology as an example, with the aim of providing references for relevant researchers.

## Full Text

### Application of Multimedia Technology in TV Variety Shows

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**Abstract:** With the continuous development of science and technology, traditional television media has faced tremendous impact. To cope with fierce market competition, the transformation and development of television media has become an inevitable trend. In recent years, numerous stage works employing multimedia technology have emerged in TV variety shows, representing a major manifestation of this transformation. Simultaneously, the effective application of multimedia technology can bring audiences a completely fresh visual experience. Based on this context, this paper first introduces the commonly used

multimedia technologies in TV variety shows, then analyzes their functions, and finally takes virtual reality technology as an example to explore the application of multimedia technology in TV variety shows, aiming to provide references for relevant practitioners.

**Keywords:** Science and Technology; Multimedia Technology; TV Variety Show; Virtual Reality Technology

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## 1. Common Multimedia Technologies in TV Variety Shows

### 1.1 Virtual Reality Technology

Virtual reality technology integrates computer graphics, real-time tracking, and stereoscopic display technologies to generate immersive multimedia experiences. In television, its application primarily divides into two categories: virtual studio technology and virtual implantation technology. Virtual studio technology represents the application of virtual reality in television production, emphasizing the integration of traditional chroma keying with computer-generated virtual objects to create strikingly realistic scenes [2]. Virtual implantation technology, developed from virtual studio technology, differs in its placement of virtual elements: while virtual studios focus on background replacement behind actors, virtual implantation positions virtual objects in the foreground, typically in front of performers. The working principle involves creating virtual models through 3D design software, importing them into specialized graphics software, and synchronizing them with camera movement data captured by sensors. This establishes a tightly coordinated perspective relationship between the virtual models and the moving camera, which is then composited onto the foreground to achieve a dreamlike virtual-real integration effect.

### 1.2 Augmented Reality Technology

Augmented reality (AR) technology, also known as expanded reality, synthesizes virtual reality, image recognition, and motion capture to precisely overlay digital information and 3D virtual models onto real scenes. As a crucial bridge connecting virtual and physical worlds, AR significantly enhances spatial imagination and practical presentation effects, enabling originally virtual scenes to blend and superimpose with reality to construct entirely new environments. In the past, designers had to imagine effects mentally when creating scene renderings through computer software, limiting final outcomes. With AR technology' s advantages in display and visualization graphics algorithms, effective virtual-real integration can simulate desired effects. AR headsets and glasses facilitate

real-time interaction with virtual worlds, allowing users to experience remarkably realistic effects. Moreover, maturing AR devices encompass both hardware and software components, including acquisition lenses and transmission chips, which correspond to virtual image generation systems and registration systems. These systems play a particularly vital role in AR experiences, making AR development essentially a matter of system research and development. Through technological innovation, more outstanding positioning and display effects can be achieved.

### 1.3 Holographic Projection Imaging Technology

In recent years, holographic projection imaging technology has seen continuous development and application. Based on light interference and diffraction principles, it can record and reproduce objects as three-dimensional images. Fundamentally, this technology uses optical principles to generate stereoscopic images via air or special three-dimensional screens. Capable of 360° 3D imaging, it allows audiences to view images from different angles. The resulting images are not only bright and vivid but also feature excellent clarity and contrast. In a sense, this also belongs to the category of virtual imaging technology, but unlike virtual implantation, it can be experienced by both television and live audiences [3]. Holographic projection imaging technology comprises graphics workstations, 3D image control and imaging systems, projection equipment, and image generation components. With this technology, on one hand, it can create three-dimensional phantom effects in space; on the other hand, it enables interaction between phantoms and actors, achieving unexpected performance outcomes.

### 1.4 LED Large-Screen Technology

LED large-screen technology involves 拼接组合大量 LED 视频单元 (assembling numerous LED video units), connecting them in series through network cables to ensure coordinated video content, which is then linked to a controller and ultimately to a computer. Notably, each LED video unit is equipped with an information signal transmission card and a signal acquisition card—the former for sending signals and the latter for acquiring video signals from the computer. Additionally, a specific LED large-screen playback software enables direct video playback through computer operations. By supplementing stage performances, LED large-screen technology not only enriches performance content but also provides audiences with distinctive viewing experiences. Commonly used LED video units in recent TV variety shows include color curtains, color bricks, and color crystals. Color curtains were first used as background screens on a large scale in a CCTV Spring Festival Gala, delivering stunning effects that won widespread acclaim from industry professionals and audiences. Color bricks build upon color curtain capabilities by adding waterproofing and impact resistance, making them suitable for 铺设各种舞台空间 (covering various stage spaces) to create comprehensive stage impact spaces. Color crystals represent further development of LED large-screen technology, offering greater three-dimensionality

and achieving display refresh rates exceeding 600Hz for clearer, more stable video presentation.

## 2. Functions of Multimedia Technology in TV Variety Shows

### 2.1 Creating Atmosphere

During TV variety shows, audiences' visual and auditory senses enter an excited state, continuously absorbing meaningful and valuable information. Creating magnificent stage settings that align with the theme represents a key objective for production teams. Achieving this artistic effect requires addressing issues of temporal and spatial alternation and transformation. With the continuous development of multimedia technology in recent years, numerous related technologies have been introduced into TV variety show production. For instance, virtual implantation technology can create a virtual-real integrated spatial atmosphere by constructing creative virtual scenes that effectively combine with actual performance spaces [4]. This technology can produce gorgeous scenes that deliver powerful visual impact and immerse audiences. For example, in a CCTV Spring Festival Gala performance of the folk song "The Wind Blows Through the Wheat Fields" by Sun Li and Li Jian, virtual implantation technology created a vast golden wheat field on television screens, delivering strong visual expressiveness.

### 2.2 Dynamic-Static Coordination

TV variety shows aim to present audiences with magnificent audio-visual feasts, requiring performers to possess excellent stage performance qualities. With the increasing integration of multimedia technology in stage performances in recent years, traditional stage acting has effectively merged with new multidimensional artistic spatial elements. For example, traditional Chinese cultural elements such as landscape paintings and martial arts can be combined with stage performances and multimedia technology to deliver unique audio-visual experiences. In numerous recent TV variety shows, cases have emerged where dynamic virtual scenes are cleverly integrated with performers' dances based on landscape painting elements, while traditional martial arts movements are effectively blended with dance art to demonstrate both strength and grace, exhibiting artistic characteristics of dynamic-static combination and interconnected methods. The endlessly changing dynamic multimedia technology provides powerful support for performers to fully express their works.

### 2.3 Virtual-Real Interweaving

TV variety shows typically emphasize skillfully presenting virtual world elements while depicting real-world objects, immersing audiences to the point where they can hardly distinguish between virtual and real. Taking the CCTV Spring Festival Gala as an example, since its inaugural broadcast in 1983, the Gala has

delivered numerous audio-visual feasts to Chinese audiences. Throughout this process, the production team has continuously explored how to better achieve visual presentation. Since 2013, various multimedia technologies have been gradually introduced into successive Galas, allowing audiences to witness stage presentations completely different from the past, with diverse stage elements continuously transforming from planar to three-dimensional forms. By employing professional cinematography techniques such as chiaroscuro and perspective, combined with advanced multimedia technology, the Gala creates authentic virtual situations. For instance, in the 2017 Gala performance, the Shanghai subvenue production team skillfully integrated traditional Shanghai architecture with modern buildings in the set design, creating a unique scene through the visual impact of tradition versus modernity that gave audiences a refreshing experience.

## 3. Application of Multimedia Technology in TV Variety Shows: A Case Study of Virtual Reality Technology

### 3.1 Functions of Virtual Reality Technology in TV Variety Shows

The functions of virtual reality technology in TV variety shows primarily manifest in the following aspects: First, opening with virtual three-dimensional scenes that combine virtual and real elements, transitioning cleverly from virtual to actual venue scenes, delivering powerful visual impact to audiences. Traditional TV variety shows typically used hard cuts or dissolves for transitions from opening to live scenes, often creating a rigid and inflexible impression. By contrast, applying virtual implantation technology to opening production, with virtual elements leading into the real venue, achieves seamless continuity. Second, closely aligning with program themes to create virtual situations that enhance atmosphere and significantly boost artistic charm. Traditional stage presentation methods such as electronic screens, sound systems, and lighting increasingly fail to meet audience aesthetic demands. Virtual implantation technology can effectively compensate for this deficiency. For example, in song and dance performances, virtual implantation technology can design unique virtual situations based on program requirements, integrating performers into these environments to help convey the ideological content intended by lyrics or dance, thereby enhancing artistic expressiveness. Third, enabling interaction between real and virtual characters to break spatial and temporal limitations. Virtual implantation technology can introduce virtual characters onto real stages to perform alongside actors, creating stage effects that blend virtual and real, making it difficult to distinguish truth from illusion.

### 3.2 Application of Virtual Reality Technology in TV Variety Shows

In recent years, virtual reality technology has been widely applied in TV variety shows organized by CCTV and provincial television media. This section examines its application in a specific Spring Festival Gala.

**3.2.1 System Architecture** That year' s Gala employed a special 升降模块阵列舞台 (lifting module array stage). To ensure camera shot fluidity and stage integrity, jib cameras were abandoned during virtual camera adjustment, while fixed cameras in long-range positions were introduced for virtual implantation. The virtual experience audiences received was achieved through virtual cameras positioned on the studio' s second floor, which, with wide-angle lenses, could comprehensively present the entire stage and fully showcase the magnificent stage effects realized through virtual implantation technology [5]. The virtual implantation workflow for that Gala included: (1) controlling virtual camera shots through a camera controller; (2) transmitting video signals and virtual tracking signals from cameras to high-definition graphics rendering workstations via high-performance link modules; (3) designing virtual effects at the design end and establishing connections with graphics rendering workstations through graphics control centers; and (4) rendering and shaping virtual effects at the control end via multi-port forwarding connections, then transmitting them to switchers for practical application.

**3.2.2 Scene Production** To create dreamlike virtual-real integrated stage effects, besides employing advanced hardware and software technologies, effective virtual element design is crucial. Virtual element design must consider two aspects: ensuring effective integration with venue space and environment, and ensuring alignment with program themes and atmosphere. In that Gala, various virtual elements were arranged around the stage, with virtual plants and other elements even appearing in the audience area during certain performances [6]. Virtual element design emphasizes development based on different program themes and actual stage aesthetics, treating them as an inseparable whole. Therefore, during design and production, continuous consideration must be given to how to effectively integrate virtual elements with venue lighting, environment, and cinematography, ensuring their advantages are fully leveraged to deliver virtual-real integrated visual experiences.

**3.2.3 Virtual Coordination** Compared to virtual studio technology, virtual implantation technology application in TV variety shows is significantly more complex. First, regarding virtual scene layout, relevant staff must thoroughly understand program content to design virtual elements aligned with program themes. Second, modeling and texturing must be as harmonious as possible, with careful adjustment of actual venue elements, camera positions, and lighting tones to coordinate with virtual elements and achieve effective integration with real scenes [7]. Additionally, coordination between virtual elements and switching directors is critical, requiring real-time adjustments to scenes and broadcast templates based on director requirements and virtual camera movements. Continuous 磨合 (fine-tuning) with camera operators, lighting technicians, and directors during on-site debugging ensures satisfactory final broadcast results.

## Conclusion

With the rapid development of multimedia technology, its effective application in TV variety shows has become a major trend in television media transformation. Practice demonstrates that multimedia technology not only enriches performance content but also provides audiences with distinctive viewing experiences. Therefore, relevant practitioners should explore how to more effectively implement multimedia technology in TV variety shows, clarifying the characteristics of various multimedia technologies, aligning them closely with program themes, ensuring comprehensive integration with all aspects of TV variety shows, and enabling multimedia technology to genuinely serve TV variety shows, delivering greater creativity and shock to audiences.

## References

[1] Gong Zhengqin, He Xiao. A Brief Discussion on the Visual Presentation of Multimedia Technology in TV Variety Shows[J]. Film & Video Production, 2015(3): 84-88.
[2] Qiangba Yundan. Visual Presentation of Multimedia Technology in TV Variety Shows[J]. New Media Research, 2017(12): 57-58.
[3] He Xiao. Exploration and Practice of Multimedia Imaging Technology in Local TV Station Variety Shows—Taking Jiaozuo Radio and Television as an Example[J]. Film & Video Production, 2016(7): 58-61.
[4] Sun Bin. The Fusion of Technology and Art—On the Application of Multimedia Technology in TV Variety Programs[J]. China Television, 2016(2): 92-95.
[5] Li Kai. Research on Visual Presentation of Multimedia Technology in TV Variety Shows[J]. China Media Technology, 2019(4): 57-59.
[6] Cao Li. Visual Presentation of Multimedia Technology in TV Variety Shows[J]. West China Broadcasting TV, 2018(11): 63, 65.
[7] Huang Jinsong. Application of Computer Networks and Multimedia Technology in TV Stations[J]. China Media Technology, 2017(5): 2.

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