Research on the Development of Radio and Television Production Technology in the Digital Environment: Postprint

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Abstract

Against the backdrop of digitalization, broadcasting and television production currently faces challenges stemming from the Internet and electronic technologies, yet also encounters new opportunities for the development of its production technologies. The emergence and pervasive application of the Internet have now extended into the realm of broadcasting and television production; utilizing digital Internet technology to accomplish program production can improve program quality, thus presenting audiences with higher-quality broadcasting and television programs.

Full Text

Preamble

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Abstract: Against the realistic backdrop of digitalization, radio and television production now faces challenges from the internet and electronic technologies, yet these also provide new opportunities for the development of production techniques. The emergence and widespread application of the internet have penetrated the field of broadcasting production; utilizing digital internet technology to complete program production can improve program quality, thereby presenting audiences with superior radio and television content.

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Television represents a mainstream medium in video communication, and history demonstrates that technology plays a crucial role in its development. From early photoelectric technology as a foundation, it gradually evolved into the preliminary form of modern television. Subsequently, utilizing red-green-blue filter functions produced color images, ultimately ushering in the television era. In this context, television' s iterative updates have been driven by technological progress. Therefore, under such conditions, emphasizing in-depth analysis of broadcasting production development trends facilitates its smooth advancement.

In program production, computer technology is widely used, whether for switcher control or editing controllers, demonstrating the close relationship between program production and computer technology. With the continuous deepening of computer applications, audio and image processing technologies have strengthened, program formats have diversified, content expansion has been excellent, and strong appeal has been demonstrated to audiences, leading to improved ratings. Regarding Computer-Supported Collaborative Design (CSCD), its basic structure relies on internet technology, using computer technology to complete design optimization. Additionally, when optimizing synchronous tasks, digitization can integrate traditional linear workflows, optimizing planning, shooting, and post-production processes to improve overall program quality.

1.1 Overview of Radio and Television Production

Throughout the history of television development, technology has made it richer and more compelling, transcending temporal and spatial limitations through audio-visual acquisition methods to record past and ongoing events. Based on continuous technological innovation in television broadcasting, live television formats have proliferated, allowing audiences to witness various activities —including sports events and ceremonies—without leaving home. Undeniably, television represents one of the most remarkable achievements of the twentieth century. Since the emergence of the internet, television has been influenced by digital information technology, prompting traditional broadcasting production to evolve toward new paradigms.

1.2 Digital Production

Supported by the internet, virtual organizations have emerged, enabling production personnel to share and coordinate various resources on shared platforms

through network technology. Simultaneously, regional teams or individuals can collaborate on projects. This model offers advantages of rapid response, high flexibility, and nonlinear characteristics. When broadcasting organizations conduct production work through digitization, original audio, video, and text materials are unaffected by time or space, allowing for arbitrary preservation, editing, and re-creation. Processed programs can also be rebroadcast. Today, program production is typically integrated with digital technologies, innovating both in form and content, which has significantly improved the quality of digital program production.

2.1 Establishment of a New Communication Mechanism

The widespread application of digital technology across various industries has transformed people' s lives, establishing an important platform for convenient communication. Today, individuals can interact with others without face-to-face contact, requiring only a computer or mobile device with internet connectivity. For program production staff, this technology significantly impacts their work by facilitating better interpersonal communication. Professionals can exchange information with colleagues via computers in a timely manner, thereby enhancing work efficiency.

2.2 More Rapid Resource Acquisition

In the broadcasting industry, digital technology has made program production more convenient. When producing programs, editors can locate relevant materials and resources unrestricted by time or space, accessing numerous production assets through computers. Compared with the past, material processing has become significantly simpler. Additionally, the convenience of material preservation has greatly improved, enabling editors to access these assets at any time.

2.3 Optimization of Program Production Workflows

The application of digital technology has effectively enhanced program production standards, optimized workflows, and improved program quality. In the past, television program production relied primarily on linear editing; nowadays, television stations predominantly utilize nonlinear editing technology, further optimizing program planning and shooting processes for better work efficiency.

2.4 Improved Work Efficiency

Before the adoption of network digitization, broadcasting information sharing typically relied on fax and telephone methods. However, these sharing models had significant limitations, with neither timeliness nor authenticity well guaranteed. Under the current network digital context, broadcasting information can be disseminated and utilized through networks. For instance, when producing news videos, network digitization can reasonably segment news information,

making video production more regionalized and spatialized. After completion, digital technology can integrate the segmented videos. This approach ensures both the efficiency and quality of broadcasting news video production.

2.5 Completion of On-site Production and Editing

Radio and television primarily serve to disseminate information, with news being an important carrier. Consequently, news holds a significant position in broadcasting. News programs fundamentally require authenticity and timeliness, which typically results in tight production schedules and demands extremely high personnel competency to process collected information effectively within short timeframes. Supported by network digitization, news gathering and editing can be accomplished remotely without on-site presence, fulfilling the timeliness requirements of news broadcasting.

3.1 Motion Tracking Technology Analysis

To achieve better motion tracking effects for program visuals, it is essential to carefully observe video shooting parameters before production. After mastering relevant data information, appropriate data should be imported based on actual conditions to ensure consistency with video content. Simultaneously, the use of data tracking technology can enhance production efficiency when effectively integrated with specific image requirements, meeting the standards for various program productions. For example, if broadcast program images fail to meet clarity standards, the picture becomes blurred, delivering poor viewing experiences. Therefore, manual tracking modes can be employed to introduce tracking technology and improve image quality. If program image quality is already satisfactory with clear feature points, automatic tracking methods can be utilized during production. For image quality between these two extremes, a combination of manual and automatic approaches can be applied in practice to achieve better clarity and enhance audience experience.

3.2 Digital Editing Technology

In program production, quality directly correlates with station standards. Digital editing creates favorable conditions for gathering, editing, and reviewing, while video servers disseminate program content and information, making television production more networked and digital, thereby enhancing efficiency and standards.[1] Specifically, numerous domestic broadcast stations and production departments are gradually adopting nonlinear editing systems to better demonstrate material production and editing processes. Utilizing nonlinear network editing and production can effectively connect standalone editing systems through networks, transforming centralized single-station production into multi-station collaboration and shifting dispersed traditional resources into a network-shared state, driving program production toward integration.

3.3 Virtual Studio

In program editing and production, virtual studio technology is employed, particularly in network program systems, to accomplish virtual live broadcasting and network replay tasks, enabling audiences to share programs in real-time via network platforms while capturing exciting moments.[2] For instance, in sports programs, this technology can present dynamic three-dimensional visuals to viewers. Simply changing camera positions allows multi-angle presentation of live scenes, improving audience perspective experiences and making programs more user-friendly.

4. Application of Radio and Television Production Technology in Digital Environments

4.1 Web 3.0

In a digital environment, Web 3.0 represents an important technology for program production. It can integrate video information and materials, improving information accuracy and significantly aiding video data retrieval. Simultaneously, Web 3.0 can distinguish and separate the credibility of published information, then utilize aggregation technology to consolidate video content, making radio and television programs more personalized.

4.2 News Production

Influenced by the digital environment, modern media application is extremely important in radio program production, such as news processing and production.[3] During production, material processing is crucial, enabling digital reorganization and editing to ensure video quality. In video processing stages, production personnel must possess strong professional competency and emphasize coordination with other segments. Strengthening network technology usage and relying on computer operations improves news production quality.

4.3 Application of SDH Technology

This technology emerged in the 1980s and has matured into a highly developed digital technology. It can synchronize with networks, simplifying multiplexing and demultiplexing while supporting continuous increases in optical bit rates, and has been applied in broadcasting information transmission. Compared with other current network digital technologies, its advantages primarily lie in defining ports and speeds, establishing unified standards for broadcasting technology with excellent compatibility and applicability.

4.4 Application of DVB-C Technology

This technology belongs to the standard for digital cable television broadcasting systems. It can utilize universal scrambling algorithms to obtain common

interfaces for information content and data, making television production more networked and digital, thereby enhancing efficiency and standards.[4] Taking the descriptive information called SI in DVB system transmission as an example, this technology can define a technical platform that effectively supports video systems and provides necessary support for network card control.

4.5 Application of HFC Network Technology

This constitutes a network combining optical fiber and coaxial cable. HFC comprises optical fiber trunk lines, coaxial cable branch lines, and user distribution networks, capable of transmitting large volumes of information and completing two-way transmission. Its working process involves converting cable television program signals into optical signals, which are then transmitted along trunk lines. Upon reaching user areas, they are converted back into electrical signals and distributed through splitters, delivering the electrical signals to users via coaxial cable.[5]

5.1 Virtual Reality Technology

This belongs to a class of simulation systems capable of creation and experience, generating simulated environments through computers. Users can interact and exchange ideas through this system. In broadcasting production, this technology is generally applied in virtual studios, which represent an emerging and unique program production technology.[6] Its essence primarily involves using computer technology to effectively create virtual three-dimensional scenes and integrate them with filmed images through digital means. Because such systems are supported by camera tracking technology, they obtain necessary data and merge computer-generated scenes. Background imaging is based primarily on shooting parameters, maintaining the same three-dimensional perspective relationship as actors to prevent final images from appearing unnatural. Since scenes rely almost entirely on computer technology, changes are simple and diverse, substantially optimizing studio environments and enhancing viewability. Virtual studios use software to generate scenes and props, overcoming physical space limitations when space is constrained, producing high-quality programs with greater creative scope. Computer-based production saves human, material, and financial resources while shortening production cycles. Abroad, this technology is applied across numerous industries including medicine, industry, and entertainment, whereas in China, its application remains in the early stages, primarily in television production.

5.2 Motion Tracking Technology

This technology belongs to a commonly used technique for post-production compositing in film and television, now widely applied in film, television, and MTV production. It typically requires tracking a specific point in source material, then enabling target layers to automatically follow that point' s movement.[7]

In tracking, numerous factors affect image quality, such as noise and foreground occlusion. To prevent these defects and improve image quality, attention must be paid to relevant video parameters during import. During tracking, production technology selection should be practical and based on actual image conditions. If images are clear and evenly distributed, automatic tracking can be used followed by manual adjustments. If images are blurry with unclear features and noise issues, manual tracking is required. This technology is typically used for modifying and supplementing tracked layer images and is indispensable in post-production.

5.3 PC-based Post-Production

The effective integration of computer hardware and software technologies has produced digital technology, maximizing both efficiency and benefits in post-production work. In such systems, hardware platforms typically include workstations and PCs. PCs are particularly stable, support numerous software types, and allow convenient upgrades, making them the most frequently used option currently.[8] Nonlinear editing represents an editing method generally applied in post-production for television and other media. Supporting editing software includes Adobe Premiere, Speed Razor, and ULead Media Studio, which constitute the most important components of digital post-production. Traditional video production essentially required participation of photography and recording equipment in analog processing. However, nonlinear editing does not demand expensive equipment; ordinary recording devices combined with multimedia capabilities can accomplish special effects editing and ultimately produce effective broadcast and video output.

Conclusion

In summary, against the backdrop of digital technology, broadcasting production continues to advance. Influenced by technological innovation and other entertainment options, programs seeking to maintain audience attention and ratings must emphasize the application of emerging technologies while addressing audience needs. Only then can future productions better satisfy public demands, capture attention, and continue to develop.

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