

A Preliminary Analysis of the Application of Digital Audio Technology in Broadcasting Engineering: Postprint

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Abstract

With the development of modern digital information technology and the continuous expansion of digital application scope, digital audio technology has been widely applied in broadcasting and television engineering. How to comprehensively promote the healthy and rapid development of digital audio technology in broadcasting and television engineering has become an important issue for professionals in related fields. This paper systematically elaborates on the application pathways of digital audio technology in broadcasting and television engineering based on an analysis of its principles and advantages, aiming to provide further references for enhancing the construction of digital audio technology in broadcasting and television engineering.

Full Text

Preamble

With the development of modern digital information technology and the expanding scope of digital applications, digital audio technology has been widely adopted in broadcasting and television engineering. How to comprehensively promote the healthy and rapid development of digital audio technology in broadcasting engineering has become a critical challenge for professionals in related fields. This paper systematically elaborates on the application pathways of digital audio technology in broadcasting engineering based on an analysis of its principles and advantages, aiming to provide further reference for enhancing the construction of digital audio technology in broadcasting engineering.

Keywords: Broadcasting Engineering; Digitalization; Digital Audio Technology; Application; Principle

1. Digital Audio Principles

Digital audio refers to a data sequence representing sound intensity, obtained by processing analog audio signals through sampling, quantization, and encoding. In digital audio technology, different encodings correspond to different audio formats and technologies. With continuous advancements in modern digital audio technology, the precision of 16-bit digital audio output can be improved to $1/64000$, thereby effectively reducing capital investment in broadcasting engineering. Additionally, digital audio technology offers greater advantages in audio processing through effective analog-to-digital/digital-to-analog conversion, greatly facilitating audio editing, synthesis, and special effects processing during radio and television program production. Simultaneously, this technology provides significant cost advantages in storage, transmission, and networked applications.

2. Application Advantages of Digital Audio Technology in Broadcasting Engineering

Currently, the advantages of digital audio technology in broadcasting engineering are primarily concentrated in four aspects. First, multi-track recording. Audio tracks are a crucial technology in broadcasting engineering, encompassing digital audio recording, broadcasting, and program management. Modern digital audio technology can enhance the recording quality of music and speech programs while ensuring effective program management and playback. It also enables reasonable and effective overdubbing or “moving” of individual tracks during recording and allows for audio track expansion to meet diverse public demands for audio content.

Second, improved editing precision. Digital audio technology can accurately edit audio waveforms, bringing tremendous convenience to audio editing and cutting work. This not only enhances the precision of sound editing but also improves audio editing quality, enabling the production of perfect audio for the public.

Third, high flexibility. During digital audio information transmission, digital audio technology can effectively implement accurate transmission control, enabling intelligent management of text information, email information, and other data within programs. This demonstrates the flexible advantages of digital audio technology while also enhancing dynamic grouping of audio broadcast terminals.

Fourth, strong reliability. Digital audio technology can effectively achieve resource sharing and storage, improving the search, classification, and organization of audio materials. It also enables timely backup of relevant audio and programs for broadcasting engineering applications. Even when equipment failures occur, conversion and fault-tolerant processing can be performed, enabling systematic data management.

3.1 Application in Digital Mixing Consoles

With the rapid development of broadcasting engineering, the digital mixing console has become one of the most fundamental technical facilities. When applied to digital mixing consoles, digital audio technology can achieve reasonable and accurate control of audio signals through relevant processing functions, thereby improving audio signal quality. Meanwhile, digital audio technology can effectively filter and eliminate various interference signals while preserving the original functions of the mixing console, achieving noise reduction and improved audio quality. Additionally, digital audio technology features matrix switching functionality, making audio switching in radio and television programs simpler and faster. The application of digital audio technology in mixing consoles also simplifies audio editing and production for radio and television programs, meeting the audio adjustment and variation requirements of different programs. While fully leveraging digital audio technology, it can improve spectrum utilization efficiency and enhance the processing and editing capabilities of radio and television programs for various audio information. Due to the higher integration of digital audio technology, the size of mixing consoles can be effectively reduced, providing greater mobility and convenience for broadcasting engineering applications.

3.2 Application of Audio Embedding Technology

In modern broadcasting engineering, digital audio embedding technology is primarily used for audio information processing. Through digital audio embedding technology, the efficiency of various audio production and transmission can be improved, making music production and distribution more convenient and achieving more perfect audio effects. The application of digital audio embedding technology can establish a complete and fully functional digital audio processing workstation, optimizing audio processing modes and improving broadcasting program audio quality through professional audio processing. This also saves substantial human and material resources for broadcasting engineering. Audio embedding technology primarily processes audio signals within specific ranges. Therefore, when applying audio embedding technology, suitable embedding points must first be identified to maintain accurate correspondence between video images and audio signals in television programs, thereby achieving improved video quality. Furthermore, audio embedding technology enables synchronous processing of video and audio signals without separate handling, which can reduce television program production and editing time while improving pre-production and post-production efficiency and ensuring program quality. With the continuous development of digital audio embedding technology, broadcasting engineering should increase its emphasis and utilization rate, establishing a comprehensive usage and management system to enhance supervision of entire television program production and editing processes, laying the foundation for ensuring broadcast and television program quality.

3.3 Dante Transmission Technology

Compared with traditional transmission technologies, Dante digital audio transmission technology offers excellent audio information compression functionality, effectively improving complex layout patterns and saving substantial resources for broadcasting engineering investment. Dante digital audio transmission technology enables audio signals and related voice services to be transmitted through UDP/IP network signals, allowing more audio information to be transmitted over networks. It also features plug-and-play functionality, enabling local network connection through a single Dante network system and effectively achieving flexibility and convenience in Dante digital audio transmission technology.

3.4 DRA Coding Technology

Currently, the DRA digital audio coding technology adopted domestically is based on research and development by Guangdong Digital. With the improvement of domestic audio coding standards, DRA digital audio coding technology has been widely applied in broadcasting engineering, including cable television, terrestrial wireless digital television, satellite television broadcasting, and other fields. Simultaneously, DRA digital audio coding technology can simultaneously encode multiple channel surround sound and stereo in broadcasting engineering, effectively addressing various complex coding issues in radio and television programs and improving work efficiency through its compression technology during actual audio coding processes.

3.5 Digital Television Source Decoding

Source decoding in digital television eliminates redundant repetitive information in programs through compression to achieve efficient coordination between source code rate and channel capacity, ultimately ensuring data transmission integrity. The purpose of encoding and decoding is to effectively correct erroneous codes to enhance stability. Channel coding can insert additional code elements into the original data stream to enable error detection and correction at the receiving end. Therefore, digital audio technology can effectively improve the application efficiency of digital television source decoding and ensure program quality.

3.6 Digital Television Multiplexing Technology

After signals and data in television programs undergo source encoding, they directly enter the multiplexing and audio signal multiplexing stages before being identified by the channel encoder. However, traditional analog signal television does not employ a multiplexing system, so sound and image information in television programs are transmitted through different channels. In digital audio technology applications, video, images, and sound can be processed through digital audio technology, enabling data bitstreams to be jointly encoded into a

single serial bitstream that can be directly transmitted to channel encoding for unified modulation. Additionally, the mechanism at the receiving end is opposite to the multiplexing stage, as it centrally integrates and processes television program data signals, improving the classification and expansion capabilities of these data signals, which is significant for enhancing the multiplexing and utilization of digital television programs.

In summary, with the rapid development of broadcasting engineering and digital audio technology in China, digital audio technology has been widely applied in pre-production and post-production audio production and editing of radio and television programs, actively promoting comprehensive improvement of program audio quality. Therefore, broadcasting engineering should further emphasize the research and development of digital audio technology applications, fully leverage the technical expertise of relevant professionals, increase scientific research and innovation efforts, apply more digital audio technologies to broadcasting engineering, and promote their popularization to provide and produce more high-quality content for the public.

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