# Application of Digital Audio Technology in Broadcast Engineering: Postprint

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## Abstract

With the continuous development of digital audio technology, television stations across various regions have begun to adopt it. By leveraging digital audio technology, real-time program monitoring can be realized, thereby enhancing program quality and reducing the incidence of television safety incidents. This paper commences with an analysis of the application advantages from the principles of digital audio technology, subsequently examines its application in broadcasting engineering from four perspectives, and concludes with an analysis of its development prospects, providing a reference for relevant professionals.

## Full Text

## Preamble

**Title:** Application of Digital Audio Technology in Broadcast and Television Engineering

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**Abstract:** With the continuous development of digital audio technology, television stations across China have begun to adopt it. Digital audio technology enables real-time monitoring of programs, thereby improving program quality and reducing television safety accidents. This paper begins by analyzing the principles of digital audio technology and its application advantages, then examines its application in broadcast and television engineering from four perspectives, and finally discusses the development prospects of digital audio technology for reference.

**Keywords:** digital audio; broadcast and television engineering; program production level; application analysis

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## 1. Basic Content of Digital Audio Technology

Digital audio technology primarily involves the technical processing of audio signals to enable better application in broadcast and television information systems. Following the active application of digital audio technology, China' s broadcast and television industry has successfully transitioned to multi-level digital broadcasting. Digital audio technology largely satisfies the content and requirements of China' s broadcast and television video production. Simultaneously, it plays a pivotal role in transmitting broadcast and television video signals by effectively enhancing transmission speed and signal strength [1]. The digitization of broadcast and television programs represents a qualitative leap in the development of digital audio for broadcasting. While reducing the workload and intensity for audio engineers, it also significantly lowers production costs for broadcast and television programs and improves the work efficiency and economic benefits of relevant organizations. From the perspective of information database functionality, the application of digital audio technology in broadcast and television digitalization projects can also enhance database quality. Using information database technology, technicians can share information resources and store digital audio assets within computer systems through processors (as shown in Figure 2). Digital audio storage technology not only facilitates the extraction and exchange of audio information but also enables staff to accurately locate relevant digital audio information within information processing systems, substantially improving storage functionality. This advancement enhances the service level of broadcast and television engineering construction while strengthening developmental capabilities [4].

## 2.1 Principle Analysis

The principle of digital audio technology primarily involves the collection of digital information and its application in transmitting electronic signals and analog-digital signals. Digital audio technology facilitates the transmission of electronic information data to issue relevant instructions, thereby causing changes in digital information waveforms. During digital information collection, attention must be paid to time interval issues to ensure accuracy and consistency. Technicians must master the characteristics and variation patterns of digital waveforms. Different digital signals transmit at different frequencies be-

cause waveform changes correspond to digital signal frequency variations. In the digital collection process, signals must undergo effective frequency modulation and transmission characteristic analysis to meet digital information transmission requirements. Digital audio technology represents the digitized product of broadcast and television information following quantization. It utilizes digital information conversion to transform continuous signals into precise reference values. During digital information quantization, technicians must also ensure timely and effective operations to avoid unnecessary losses due to processing delays. In signal transmission, digital information conversion can effectively improve audio quality and reduce noise [2]. The third key component is digital information encoding, which constitutes an important element of digital audio technology development. By encoding and decomposing digital information within audio files, the system achieves effective conversion of relevant digital signals for data type identification. To ensure effective transmission of digital information and smooth encoding, digital information must be correctly encoded. Technicians must encode and quantify digital information to form corresponding audio files and effectively calculate quantized data parameters to establish a foundation for complete encoding of high-quality data information.

## 2.2 Application Advantages

### 2.2.1 Excellent Quality and Effect

The application of digital audio technology in broadcast and television engineering enables more efficient and complete storage of information and data, achieving superior processing results. Digital audio processing technology has developed alongside computer networks. Currently, China' s digital audio technology achieves extremely high precision, reaching over 1/64000. Consequently, an important function of broadcast and television program digitization is ensuring program quality and effectiveness. Under the influence of information technology, the fundamental nature of broadcasting and television has undergone fundamental changes.

### 2.2.2 More Complete Functionality

Traditional broadcast and television programs exhibited poor performance, primarily due to inadequate voice editing technology. The application of digital audio technology is crucial for improving program effects. Sound is collected on different tracks and then input into computer systems. During this process, if technicians make errors, they can purposefully and targeted repair audio files without requiring re-recording before program editing. Digital audio technology not only enhances the service level of broadcast and television engineering construction but also strengthens the functional development of engineering projects [3].

### 2.2.3 Achieving Precise Audio Editing

Due to the low precision of traditional audio editing technology, adopting modern digital audio technology in audio editing can overcome the shortcomings of conventional editing methods and improve editing accuracy. Digital audio editing utilizes waveform technology to transmit unmodified audio signals to computer displays, then corrects the displayed content during editing to achieve desired program effects. This technology not only facilitates technicians but also ensures editing accuracy.

## 3. Specific Applications of Digital Audio Technology in Broadcast and Television Engineering

### 3.1 Digital Watermarking Technology

The basic framework consists of original watermarks, watermark budget processing algorithms, original audio data, private or public keys, and other components that together form the watermarked audio file. First, technicians must prioritize audio data conversion and processing. Regarding the vulnerability of audio watermarking technology to force majeure attacks during operation, issues such as resampling, noise interference, statistical attacks, and data compression must be considered. Second, technicians must pay attention to perceptually similar audio watermarking technology. During the embedding process, to avoid perceptual changes, appropriate embedding methods must be selected to ensure auditory similarity of digital audio.

### 3.2 Digital Audio Embedding Technology

Digital audio technology is primarily applied in post-production and recording of broadcast and television programs, effectively improving production efficiency and quality. Through scientific and reasonable pre-recording methods using digital audio technology, embedding functions can enhance embedding stability. Currently, China' s broadcast and television engineering has achieved remarkable results in many aspects, but numerous problems and deficiencies remain in actual development that require urgent resolution and advancement. To further promote the healthy and sustainable development of China' s broadcast and television engineering, modern science and technology should be actively introduced for deeper research to improve broadcast and television program quality and optimize audio-visual presentation.

### 3.3 Audio Comparison Technology

Focus should be concentrated on controlling audio data for broadcast and television programs. Technicians must pay attention to track adjustment. The 64-track digital hard disk modulation mode can ensure smooth broadcast quality of radio and television programs during recording.

### 3.4 Application of Digital Mixing Consoles

Mixing consoles are the most widely used basic equipment in recording facilities. However, when applying digital audio technology to broadcast and television engineering, established principles regarding mixer performance must be followed: sound must remain stable between 20 Hz~20 kHz, and tone uniformity must not be less than $±$1 dB. Digital audio technology can be used for audio amplification, timbre adjustment, and pitch modification. After noise reduction for broadcast and television programs, expected effects can be achieved. Practice has proven that combining digital mixers with digital audio can effectively solve broadcast noise problems. Additionally, digital mixers can add switching functions for functional modules, enriching their capabilities.

### 3.5 Recording and Post-production

Recording and post-production can reduce quality issues caused by production errors. Digital audio embedding technology plays a significant role in signal transmission and generation during practical application. Some differences exist between analog and digital signals in television video signal conversion schemes. After data acquisition, transmission methods can be divided into serial transmission and parallel transmission.

## 4. Transmission Technologies

### 4.1 Transmission Technology

Traditional audio transmission technology still has some problems regarding compression functions. The introduction of Dante transmission technology in broadcast and television engineering represents a new data transmission method. Digital audio transmission technology, with its excellent compression performance, has changed previously complex transmission methods. The new layout approach saves engineering investment, reduces construction difficulty, and facilitates smoother project implementation. A particular advantage of this transmission technology is its ability to transmit voice data through UDP/IP network signals and audio through networks. Connecting the Dante network system via local area network enables convenient audio acquisition and plug-and-play functionality.

### 4.2 Encoding Technology

The application of broadcast drama encoding technology is becoming increasingly widespread. Introducing DRA encoding technology in project implementation will undoubtedly promote the development of broadcast and television projects. The development of Guangxian Digital has reference significance for DRA digital audio encoding technology. With the improvement of domestic audio encoding standards, DRA digital audio encoding technology has become widely applied in television broadcasting, demonstrating high application value.

It can achieve simultaneous encoding of multi-channel surround sound and stereo, not only completely eliminating losses caused by complex encoding technology but also promoting the application and development of digital audio technology in broadcast and television.

[Figure 4: see original paper] Audio Encoding Process Flowchart

### 4.3 Source Decoding

Source decoding technology primarily eliminates redundant information content from programs, removing repetitive information to avoid audience aesthetic fatigue. Source decoding technology improves transmission efficiency by compressing and coordinating source decoding rates with channel capacity. Error information generated during speech encoding can be corrected through source encoding and decoding. Channel coding of original data increases symbol count and enhances error correction capability.

### 4.4 Multiplexing Technology

Compared with traditional digital television, sound and image information in television programs can be transmitted through multiple channels. Multiplexing technology enables unified modulation, allowing stable data transmission within a single channel. Digital audio technology can also classify and expand the aforementioned data information, which constitutes an important component of multiplexing technology.

## 5. Development Directions of Digital Audio Technology

The arrival of the information age has brought great convenience to human society. The research and application of digital audio technology in China is based on the development of intelligent, digital networks. Considering impedance characteristics for cable loss control, polyethylene-insulated spiral cables are selected to achieve cable functionality. Additionally, the standing wave ratio of UHF and VHF should be less than 1.06 to reduce cable loss and standing waves. Digital audio technology can provide audiences with high-quality programs and improve audio quality. Therefore, research on digital audio processing technology must be continuously strengthened, technical experience continuously absorbed, and digital audio technology research enhanced to enable it to play its proper role in long-term construction. As the foundation of broadcast and television engineering construction, digital audio technology should be further perfected and developed, and applied in specific broadcast and television engineering projects to improve the overall quality of broadcast and television programs.

Contemporary social development requires emphasis on media-audience interaction and efforts to achieve bidirectional signal transmission. Using digital audio technology can strengthen connections with audiences, realize new audio transmission modes in broadcast and television engineering, improve the populariza-

tion rate of broadcast and television engineering culture, enable greater audience participation in information dissemination, and thereby enhance broadcast and television engineering capabilities.

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[Figure 1: see original paper] Structure Diagram of Digital Audio Workstation
[Figure 2: see original paper] Composition of Digital Audio Processor
[Figure 3: see original paper] Digital Audio Technology Process
[Figure 2019: see original paper] (12): 101-102.

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