Advantage Analysis and Development Discussion of Network Digital Broadcasting and Television Technology - Postprint

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Abstract

Currently, the development of Internet technology has driven the rapid advancement of digital radio and television technology, propelled the progress of China' s radio and television industry, facilitated the optimization of digital networks, and established a robust development platform for Internet television. To satisfy international demands, all countries need to appropriately invest technical resources and conduct research. This paper focuses on analyzing the advantages of digital radio and television and specifically explores the development of network digital radio and television technology.

Full Text

Analysis of Advantages and Development of Network Digital Broadcasting Television Technology

Abstract: The current development of Internet technology has driven the rapid advancement of digital broadcasting television technology, propelled the growth of China' s broadcasting industry, facilitated the optimization of digital networks, and created a favorable development platform for Internet television. To meet international demands, all countries need to invest appropriate technical resources and conduct research. This paper focuses on analyzing the advantages of digital broadcasting television and specifically explores the development of network digital broadcasting television technology.

Keywords: broadcasting television technology; network digitalization; advantages; development

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In the current development landscape, network digital broadcasting television technology operates within the broader context of global economic integration. The broadcasting industry has increasingly adopted network digital technologies with notable success. The development of digital broadcasting television technology has accelerated the popularization of digital networks in China, demonstrating an information-driven trend that also promotes national culture. To keep pace with contemporary trends, the broadcasting industry must intensify research on network digital broadcasting television technology to maximize satisfaction of people's spiritual needs and address existing technological deficiencies.

1. Overview of Network Digital Broadcasting Television Technology

During its initial development phase, broadcasting television technology employed relatively simple transmission methods due to technical limitations and material quality issues. Television signal simulation primarily relied on time-axis sampling patterns. Wired broadcasting emerged in the late 19th century with numerous defects, including poor signal reception strength that often caused significant picture fluctuations and loud static, severely impacting viewing experiences. The advent of digital broadcasting television technology ushered the industry into a new developmental era characterized by informatization and digitalization. Leveraging network digital information technology ensures effective information transmission and enhanced performance. Traditional broadcasting primarily used analog signals, whereas digital signals offer greater stability, excellent anti-interference properties, and smooth visual presentation, delivering superior quality experiences to users [1]. Network digital broadcasting features networkization and digitalization as its core characteristics, enabling online video and audio access that provides users with higher-quality services. Digital television and broadcasting programs transmit relatively stable signals across extensive coverage areas, creating new development opportunities for the industry.

2.1 Resource Sharing

Network digital broadcasting television technology offers clear advantages in enabling resource sharing. It comprehensively resolves signal instability issues by leveraging Internet platforms to acquire more information resources, expanding reception modes beyond spatial and temporal limitations to provide comprehensive services to remote areas. This technology breaks geographical barriers, allowing appropriate import of foreign television programs and providing people with more channels to access information resources, truly achieving the goal of

"keeping abreast of world affairs without leaving home." Overseas Chinese compatriots can also watch domestic television programs anytime and anywhere, enhancing their spiritual and cultural lives [2]. The Internet' s inherent high openness and unparalleled advantages in information transmission and sharing enable networked broadcasting technology to provide diversified choices, allowing users to download and watch programs according to their individual needs.

2.2 Efficient Integration of Information Resources

Traditional broadcasting programs used analog signal transmission, which was vulnerable to various factors that compromised signal quality and prevented content modification or editing after production. Audiences generally received programs through direct signal reception, resulting in poor quality with unstable pictures, fluctuating audio, and occasional signal loss. The application of network digital technology in broadcasting dramatically improves signal transmission efficiency, compensates for content deficiencies, and allows adjustments to ensure high picture quality and optimal viewing experiences.

2.3 Real-Time Processing

Before adopting network digital broadcasting technology, traditional broadcasting required substantial time for information processing, with limited transmission effectiveness even after processing. Developing network digital broadcasting technology significantly enhances information transmission rates, enabling ultra-long-distance transmission in short timeframes with stable signals, ensuring transmission quality across broader coverage areas.

2.4 Improved Work Efficiency

Traditional analog signal transmission in broadcasting suffered from multiple interference factors affecting both transmission rate and effectiveness. Network digital broadcasting technology ensures signal stability with strong anti-interference capabilities [3]. Through digital network television technology, the industry can provide audiences with more diversified programming and improved viewing experiences. Traditional broadcasting exhibited singular characteristics that failed to meet user selection needs [6]. Network digital broadcasting technology allows viewers to choose programs according to their interests. With strong support from national and government authorities, China' s broadcasting industry enjoys promising prospects, and seizing this opportunity can lead further development.

2.5 Enhanced Video and Audio Playback Quality

Analog signals traditionally delivered generally poor image and sound quality. Digital technology circumvents these disadvantages, achieving the same coverage

range without requiring high transmission power while displaying superior image quality.

2.6 High Spectrum Utilization Efficiency

Analog signal transmission typically employed one-to-one viewing modes. Network digital broadcasting technology enables users to receive multiple program signals directly through set-top boxes, which convert signals into viewable programs. Users can independently select preferred programs, optimizing spectrum utilization and enriching broadcasting content to provide more information.

2.7 Improved Anti-Interference Capability

Digital signal programming commonly uses high-low level placement to correct erroneous information. However, external factors significantly impact traditional broadcasting signals, resulting in poor anti-interference performance [4]. Digital television technology provides robust protection, offering stronger anti-interference capability and more stable digital signal transmission.

2.8 Lower Storage Difficulty

Compared with traditional television technology, digital technology significantly reduces the difficulty of storing broadcasting signal information. This is primarily because digital processing involves compression and encoding, enabling direct digital signal storage. The storage process has minimal correlation with signal characteristics or duration, facilitating other business operations. Additionally, digital broadcasting requires minimal storage space, allowing more information to be stored in the same capacity.

2.9 Richer Broadcasting Resources

Digital broadcasting television can integrate original resources while utilizing various Internet resources. Since digital broadcasting television and the Internet share consistent storage methods, this facilitates the popularization of digital broadcasting and better satisfies multi-level audience demands.

3. Development Opportunities for Network Digital Broadcasting Television Technology

The emergence of network digital technology has enriched broadcasting program content, oriented development toward humanization, and expanded application scope. This technology improves resource utilization efficiency, enables effective resource sharing, and establishes robust platforms ensuring diversified options for program processing. However, opportunities and challenges coexist. Despite technological advantages and convenience, network digital technology faces multiple challenges during development. For instance, current broadcasting televi-

sion technology exhibits certain differences from digitalization and standardization that may change over time. The broadcasting industry serves both public service functions and propaganda purposes for Party leadership, promoting social stability. According to current Chinese laws and regulations, broadcasting television lacks comprehensive legal frameworks and sufficient resource support, resulting in relatively lagging development compared with developed countries.

4.1 Television Video Signals

Digital broadcasting television technology can convert television video signals into digital signals with enhanced discreteness, strengthening anti-interference capability and preventing external factors from causing significant interference. This enables high conversion efficiency for rapid short-term transmission, ensuring clearer video pictures [7].

4.2 Digital 5G+4K Applications

4K represents advanced technology in the broadcasting field, producing ultra-high-definition video. Compared with 4K, 5G is today' s most advanced mobile communication technology offering faster transmission rates and greater connection density. It can also utilize slicing technology to provide VPN private network services, appropriately enhancing mobile broadband to drive continuous development of the information industry, reconstruct different industry chain segments, and promote healthy development in the broadcasting field.

4.3 Television Images

Digital technology application in television images helps users effectively search for programs according to their needs. It enables better image replication without quality degradation regardless of copy frequency. To effectively apply digital technology to television images, color quantities must be properly processed using cameras for signal transmission. This approach reduces signal issues prevalent in analog systems and converts different signal types into final digital signals.

4.4 Audio Digital Technology

Audio information shares strong similarities with image information and requires digital processing. Mastering image signal sampling frequency ensures audio signal frequency remains unaffected. Generally, analog signal maximum frequency should be more than twice as low as audio sampling frequency to ensure reasonable audio signals, avoid image desynchronization, and prevent noise generation. Audio information sampling frequency is widely applied in digital technology, affecting both sound quality and interference resistance. Digital broadcasting television involves not only television picture signal conversion but also sound signal processing through three steps: sampling sound signals, selecting field

frequencies associated with image signals, and converting signals for effective transmission without noise.

Baseband digital signals require modulation after encoding. This process contains many low-frequency components that can affect transmission quality [8]. Baseband digital signal modulation standardizes information transmission, typically using phase-shift keying (PSK) control to better reduce noise and ensure optimal transmission.

4.5 Separation of Television Program Production and Broadcasting

Digitalization in the television industry promotes broadcasting industry development and enriches television channels. Among numerous Chinese television programs, current quantities cannot satisfy public channel demands. Since program quality varies significantly, affecting user viewing interest, improving program quality is essential for optimal digital television utilization. Production personnel must emphasize program creation while separating production from broadcasting. This separation ensures both quantity and quality while providing users with more program choices and access to high-quality content.

4.6 Creating New Digital Television Playback Models

Traditional analog signal broadcasting featured extensive advertising occupying major portions of programs. Digital television, being subscription-based, has reduced advertisements, increasing actual program viewing time. To balance revenue, television stations have introduced subscription plans. However, many users object to advertising in paid services, believing excessive ad duration affects program viewing, which impacts advertising development and causes industry losses. Therefore, digital television must innovate advertising playback models to satisfy basic user needs while promoting digital television development.

Conclusion

Based on current developments, network digital broadcasting television technology aligns with national development pace. According to China' s fundamental conditions, effective measures must be implemented. Introducing network digital broadcasting television technology into the broadcasting field can generate greater social and economic benefits. Only by leveraging broadcasting advantages and establishing specific future development goals can we promote further television broadcasting development and provide better services to the people.

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