Research on the Upgrading and Transformation of Radio and Television Technology in the 5G Era: Postprint

Authors: Pan Weihan

Date: 2023-10-08T00:00:00+00:00

Abstract

With the rapid development of 5G technology, it is gradually becoming integrated into people' s daily lives and work. This study takes 5G technology and its characteristics as the research starting point, expounds upon the fundamental development status of broadcasting and television technology in the 5G era, and simultaneously analyzes the practical applications of broadcasting and television technology in the 5G era across multiple domains, including media and entertainment, emergency broadcasting, and others, by incorporating real-life scenarios. It also examines practical application cases in real-world settings using automotive and Internet of Things services as examples. Finally, it proposes recommendations and suggestions for the upgrading and transformation of broadcasting and television technology in the 5G era, providing referential insights for the development and widespread application of broadcasting and television technology in this new epoch.

Full Text

Exploring the Upgrading and Transformation of Broadcasting Technology in the 5G Era

Abstract

With the rapid development of 5G technology, it has gradually integrated into people's daily lives and work. This study takes 5G technology and its characteristics as the starting point, discusses the basic development status of broadcasting technology in the 5G era, and analyzes its practical applications across multiple fields including media, entertainment, and emergency broadcasting based on everyday scenarios. Real-world application cases are examined using automotive and IoT services as examples. Finally, the paper proposes recommendations for the upgrading and transformation of broadcasting technology in the 5G era,

providing reference ideas for the development and widespread application of broadcasting technology in this new epoch.

Keywords

5G Era; Broadcasting Technology; Upgrading and Transformation

1. VR/AR Broadcasting

Virtual Reality (VR) is a computer simulation technology that, supported by modern technology and utilizing computers and other equipment, simulates an environment similar to the real world. Users become immersed in the environment provided by VR technology yet experience genuine feelings and sensations. VR engages multiple senses of the audience, enhancing their authentic emotional experiences. Augmented Reality (AR) is a new technology that seamlessly integrates real-world and virtual-world information. By employing computer hardware devices and related technologies, it enables users to experience feelings and perceptions unattainable in real life. VR/AR broadcasting requires audiences to wear professional equipment to access broadcast information and content. Through 5G technology as the primary transmission medium, users can receive high-quality information with over-the-air transmission speeds exceeding 10 Mbps. The production and transmission process for VR/AR broadcasting in the 5G era is illustrated in Figure 2 [Figure 2: see original paper].

2. Remote Production and Broadcasting

Remote production and broadcasting faces large audiences, with significant variations in video content and access pathways among different individuals. Therefore, scientific and rational methods must be employed. In the 5G era, multiple 5G links can be utilized to transmit to the production and broadcasting platform, which then distributes the produced programs and content to users, greatly satisfying diverse user demands. The application of 5G technology improves video playback quality and enhances playback effects. The details of remote production and broadcasting are shown in Figure 3 [Figure 3: see original paper].

Figure 1 [Figure 1: see original paper] Integrated Broadcasting Services
Figure 2 [Figure 2: see original paper] VR/AR Broadcasting
Figure 3 [Figure 3: see original paper] Remote Production and Broadcasting

3. Emergency Broadcasting

From the perspective of application requirements, emergency broadcasting is highly demanded, typically involving the distribution and delivery of warning messages under urgent conditions. Traditional broadcasting technology, limited by technological constraints, could not simultaneously reach a wide range of users. However, given the urgent nature of such situations, network congestion or increased business load often occurred. In the 5G era, these limitations can

be overcome, ensuring the provision of emergency broadcasting services to multimedia simultaneously while promptly releasing emergency information to notify users and facilitate emergency preparedness. During information distribution and transmission, multimedia data, text messages, audio, and video can all be sent. The specific process for emergency broadcasting is illustrated in Figure 4 [Figure 4: see original paper].

Figure 4 [Figure 4: see original paper] Multimedia Emergency Broadcasting

4. Application Cases of Broadcasting Technology in the 5G Era

The practical applications of broadcasting technology in the 5G era are numerous. This study primarily introduces practical implementations in emergency broadcasting, IoT, and other aspects.

4.1 Automotive Application Case

In recent years, as the number of automobiles in China has increased, the automotive industry has developed rapidly, with related accessories and services also improving. In the 5G era, broadcasting technology provides entertainment information, road safety, and various other services for the automotive sector. Point-to-multipoint broadcasting is fully utilized to distribute information and content to multiple vehicles. The traffic information provided by broadcasting technology for automobiles includes: traffic warning information, such as congestion and blockages ahead on the driving route; road sign data, such as speed limits along the driving path; map information, such as dynamic presentation of map data for upcoming road sections; and specific locations of relevant objects. Broadcasting technology in the 5G era can provide drivers with information about vehicles, pedestrians, and other relevant elements on the streets, demonstrating that this technology has already achieved precise positioning capabilities. The application of broadcasting technology in automotive broadcasting in the 5G era is illustrated in Figure 5 [Figure 5: see original paper].

4.2 IoT Application Case

Broadcasting technology in the 5G era has overcome the limitations of the 4G era, enabling broader transmission of public data, including software and operating systems for access devices. In the IoT domain, broadcasting technology can provide software and firmware upgrade services. For example, smart water meters can display water consumption data and information. After manufacturers update and upgrade the software at the terminal, each user' s smart water meter can dynamically achieve data updates. The practical application in the IoT field is illustrated in Figure 6 [Figure 6: see original paper].

Figure 5 [Figure 5: see original paper] Application of Broadcasting Technology in Automotive Services

Figure 6 [Figure 6: see original paper] Application of Broadcasting Technology in IoT

5. Future Prospects for Upgrading and Transformation of Broadcasting Technology in the 5G Era

As mobile communication system technology and services evolve and develop from 4G to 5G, modern technology has profoundly influenced the daily lives and work of the general audience while also being widely applied across multiple social domains. The upgrading and transformation path for broadcasting technology in the 5G era involves three key directions: First, moving toward the integration of various broadcasting technologies with the internet, such as next-generation audio-video coding technology and High Dynamic Range (HDR) technology. Second, developing reverse channels for broadcasting technology. Future broadcasting services will face larger audiences and domains, making low-power, long-range communication achieved through narrowed bandwidth a transformation direction. Technologies such as Single Carrier Frequency Division Multiplexing (SC-FDM) and massive user MAC layer access technology represent future research priorities and hotspots. Third, based on the current application status of broadcasting technology in the 5G era, standardization work will be undertaken in future development, requiring efforts from multiple aspects.

For instance, China Central Television has cooperated with the three major telecom operators (China Telecom, China Mobile, and China Unicom) to develop and utilize 5G technology jointly, establishing "5G Media Application Laboratories" to promote technical testing and application of 5G core technologies in CCTV' s 4K ultra-high-definition program transmission. The combination of 5G technology with 4K, 8K, VR, and other ultra-high-definition videos brings transformations to all aspects of video content collection, editing, broadcasting, and transmission. On October 1, 2018, China Central Television successfully launched 4K ultra-high-definition video broadcasting.

In summary, if the changes in people's living and working environments following the arrival of the 4G era are regarded as the influence of an epoch, then the 5G era not only provides numerous convenient conditions for people' s lives and work but also influences the development of society as a whole. The integration of 5G technology with different social fields···

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Author Affiliation

Liaoning Radio and Television Station

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